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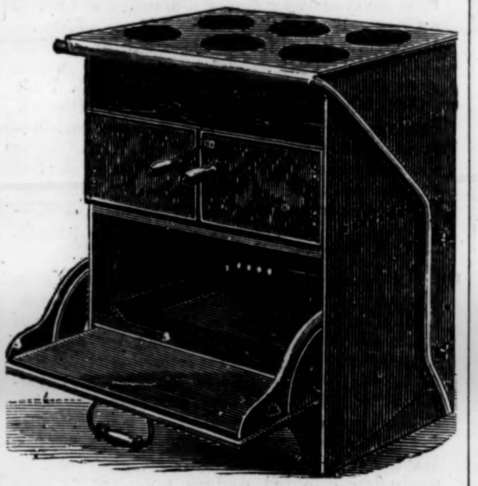

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On December 10th.—4061 to 4072.—W. H. Morgan. Compounds for removing and preventing incrustation in steam boilers. - H. Studer. Floating breakwaters.—T. Ashford. Machinery for the manufacture of cut nails, tacks, and brads.—E. Davies. Feed-water eater and fuel economiser.—A. Bonten. Machine to be used in finishing woven fabrics.—J. R. C. Taunton. Safes and strong rooms.—H. Bernadac. Regulating or controlling the supply or level of water in steam boilers.—E. Richards. Railway chairs and the means of securing them and the rails therein on railways.—T. Barnes and R. Chalk. Construction of fire-grates.—G. Haseltine.—Processes and apparatus for separating tin from tinner's waste (com.) (Complete specification).—J. H. Johnson. Oscillating cylinder engines (com.)—A. Browne. Lubricator (com.) (Complete specification).

On December 11th.—4073 to 4091.—J. L. Thomasson. Portable grate for greatly economising the consumption of fuel, and largely increasing the amount of heat radiated thereby.—J. S. Burroughs. Manufacture of beads for billiard nests and marking-boards.—C. W. Siemens. Production of iron and steel and furnaces and apparatus connected therewith.—J. Adair. Machinery used in the manufacture of dough for bread, in ovens for baking, and apparatus connected therewith.—F. H. Brady. Apparatus for economising fuel in fire-grates.—T. Moy. Slide valves of steam engines.—W. Rowett. Electric telegraph cables or ropes.—A. Browne. Machinery for screwing the soles of boots and shoes (com.)—J. Potts. Railways.—J. L. Clark C.E., and E. O. W. Whitehouse. Apparatus for recording the number of passengers conveyed in public vehicles and the distance each has travelled.—P. P. E. M. Koch. Preserving meat and other articles of food.—J. Maxwell. Fastenings applicable to railway carriage doors and otherwise.—S. Alley and J. B. Handyside. Fastenings for connecting and strengthening the ends of rails for railways or tramways, and apparatus for applying the same.—J. Gardner and T. Orme. Apparatus for grinding or crushing colours and other substances.—J. A. Ball. Dredging and excavating machines.—F. W. Turner. Motors to be worked by gas and air.—W. R. Lake. Metal package for the preservation of meat and other perishable substances (com.)—N. D. Spartali. Boilers for generating high pressure steam.—N. D. Spartali. Construction and arrangement of land and marine steam boilers and furnaces.

On December 12th—4092 to 4101—H. M. Ramsay. Disposal of sewage.—S. Emsley. Spinning and twisting.—E. M. Picard. Cravat.—S. J. Ditchfield, G. Watson, and J. Childs. Heating apparatus, and in the application of hydrocarbon or other volatile oils or spirits for heating purposes and generating steam. Complete specification). —W. Verity and B. Verity. Heaters or boilers for heating conservatories, halls, baths, &c.—W. Tatham. Callender rollers of carding engines and drawing frames.—W. E. Newton. Machinery for dividing, marking out, and cutting bevelled toothed wheels (com.)—H. Y. Scott. Cement.—F. Lambert. Grapnels for raising submarine telegraph cables. J. G. Tongue. Producing imitations of marble, applicable to walls or other surfaces, tissues, or fabrics (com.)

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On December 16th.—4128 to 4138.—G. Duty. Measuring and delivering water into water-closet pans and other receptacles.—N. Fellows. Feeding bottles. — J. Phillips. Pipe joints.—W. A. Lyttle. Process for effecting the consolidation of dust or small fragments of coal, coke, or peat charcoal into masses suitable for fuel. — C. Léchaudée. Salvage apparatus.—D. Edwards. Manufacture of tin and terne plates.—A. Wilkinson. Compounds for cleaning and polishing metals, metallic, and other articles and things.—A. Collet and P. de Lavillasse. Process of incinerating in the dry way sea-wrack, sea-weed, and like plants, and apparatus employed therein. — J. Richardson. Portable and semi portable engines for winding, pumping, and driving purposes. — W. Trafford. Machinery for spinning, weighing, sorting, sizing, doubling, twisting, throwing, stretching, and reeling into skeins silk or other fibrous materials.—L. Parker. Governor for regulating and controlling the speed of steam and other motive-power engines, particularly adapted for marine steam engines.

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On December 18th.—4154 to 4167.—E. P. H. Vaughan, F.C.S. Ornamentation of balloons formed of caoutchouc to be employed for advertising purposes (com.) (Complete specification).—J. J. Sylvester. Apparatus for guiding, tracing, cutting, or grinding tools or work operated on by such tools.—H. Moore and T. Steven. Roadways or pavements.—J. Oldroyd, M. Oldroyd, jun., J. Woodcock, and J. Coulter. Apparatus employed in dyeing, &c. —M. Whitaker. Couplings and reversing gear for revolving shafts.—G. W. Hart. Smelting iron and other ores. — Rev. G. H. Forbes. Manufacture of gas and quicklime.—C. P. N. Weatherley. Manufacturing ice.—W. Crabtree, W. H. Bottomley, J. Shackleton, and J. Naylor. Looms for weaving.—W. T. Walker. Purifying apparatus used in gas works.—A. R. Arrott. Manufacture of hydrochloric acid. — C. W. Harrison. Manufacture of gas.—A. Collet, P. de Lavillasse, and F. A. T. de Beauregard. Treating in the humid way sea-wrack, sea-weed, and like plants. — C. L. Madsen. Electric telegraph cables and insulating telegraph conductors.

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On December 30th.— 4269 to 4279. — J. Lord. Utilising waste heat. — B. J. B. Mills. Machines called "teazles," for raising the nap or pile of textile fabrics (com.)— W. Power. Utilization by steam boilers of the heat ordinarily wasted in burning lime. — E. J. Wade. Sewing machines (com.)—A. W. A. Logan. Apparatus for cleaning pipes or tubes. —E. Bazin, C.E. Life-buoys.—G. A. Everett. Coupling and uncoupling railway rolling stock.

(*Continued on page* 58.)

Scientific and Literary Review,
AND RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

APRIL 1, 1874.

PREVENTION OF ADULTERATION.

No. I.

The "Act to amend the Law for the prevention of Adulteration of Food and Drink and of Drugs," which came in force on the 10th August, 1872, took many manufacturers by surprise. That some such measure was necessary for the benefit of the public cannot be questioned, but that one should have emanated from the infallible wisdom of the British Parliament, which is so inconsistent in principle, so vexatious to trade generally, so minutely meddling and peddling, and presented in so crude a form that (seeing it has to be administered by vestry boards and police magistrates and justices of the peace in a summary manner) is much better fitted for an instrument of pseudo-philanthropic tyranny than a measure of preventive jurisprudence, is very surprising.

Mr. Lowe, in addressing the electors of the University of London, plumed himself and Mr. Gladstone's Government on the various measures achieved during their period of office; and amongst the chief, expatiated largely upon the virtues of the Adulteration of Food Act: "it was to strike a blow at that dreadful adulteration which takes place in almost all articles of food chiefly sold to the poorer classes, it was to imprison the insatiable manufacturer, annihilate the unscrupulous trader," give us food and drink so pure that it would abolish the doctor; indeed, that such unadulterated diet should so influence our health that we would become a race far superior to anything Dr. Darwin has conceived for us in the future, or Lord Lytton pictured in his ideal world of the "Coming Race."

We certainly cannot congratulate either Mr. Lowe or Mr .Gladstone's Government on the passing of this measure, nor its final result in practical experience. This Act, like many during the past few years, passed the House when few members were assembled. Mr. Lowe's desire to cure a growing evil may be sincere, but his ideas of commerce both at home and abroad are much too superficial to legislate on matters so affecting the community at large. That Mr. Gladstone intended to adhere to the wording of the Act, in the face of all opposition, is clear, from his declining to receive the deputation from the "National Chamber of Trade."

The clauses which most seriously affect the manufacturer and retail dealer are the following:—

"Every person who shall wilfully admix, and every person who shall order any other person or persons to admix with any article of food or drink, any injurious or poisonous ingredient or material to adulterate the same for sale, and every person who shall wilfully admix, and every person who shall order any other person or persons to admix any ingredient or material with any drug to adulterate the same for sale, shall for the first offence forfeit and pay a penalty not exceeding fifty pounds, together with the costs attending such conviction, and for the second offence shall be guilty of a misdemeanour, and be imprisoned for a period not exceeding six calendar months with hard labour," 35 & 36 Vict., c. 74, s. 1; Section 2, which renders the sale with knowledge of anything so adulterated liable to twenty pounds penalty; and Section 3, which provides that "Any person who shall sell any article of food or drink or any drug, knowing the same to have been mixed with any other substance with intent fraudulently to increase its weight or bulk, and who shall not declare such admixture to any purchaser thereof before delivering the same and no other, shall be deemed to have sold an adulterated article of food or drink or drug, as the case may be, under this Act":—

Thus we have a most absurd confusion of utterly distinct classes of actions; for the wilful putting of any *injurious* or *poisonous* ingredients into any article or material, or trafficking with an article so adulterated, every right-thinking person will at once recognise as a fit subject for criminal punishment, it being analogous to manslaughter; whereas the admixture of harmless ingredients simply for the purpose of commercial advantage is an action which has really more of the nature of a civil injury than a criminal offence, at any rate, its criminality must often be lessened by its being done, as it frequently is, to meet the "heap for a cheap" notions of economy so commonly prevalent not as a money fraud. Moreover, although the real mixer or adulterator is liable to a heavy fine and imprisonment; yet, a person who *wilfully sells poisonous material* is liable to a smaller fine and nothing is said about imprisonment, and the effect of Section 3 seems to be to relieve a seller from punishment if the weight or bulk be not increased, which in principle is another curious conception.

The articles which have recently come under the notice of the analysts who are enforcing the Act are:—Mustard, cocoa, tea, coffee, sugar, pepper, milk, &c. The first—an article of large consumption, already severely handled by analysts—will suffice for our present notice.

Mustard.—The knowledge of the virtue of mustard seed dates from a very early period. Its medicinal value is said first to have been discovered by the Greek physician Æsculapius. It was also known to the Jews, and to this day grows abundantly in Palestine as the *phylolacca dodecandra.* It is difficult to determine the date of its first use in this country, though probably at a very early period. Burton speaks of it having been used as a sauce in the twelfth century. Its dietetic use is of great benefit; it greatly assists the organs of digestion, excites the gastric juices of the stomach, and, acting as a tonic, promotes the appetite. The manufacture of mustard in its present form was commenced about the year 1720 by a Mrs. Clements, of Durham, who first conceived the idea of grinding the seed and dressing the flour: by her it was kept a secret for some years until she amassed a large fortune. Its first manufacture in London commenced in the year 1742, when a factory was built at Garlick Hill, City, now held by Messrs. Keen, Robinson, Belville, and Co., where a large and increasing trade is still carried on, which has caused "Keen's Mustard" to be known through all parts of the world—for which article, alone, they have received two gold medals. This firm is now making strenuous efforts to abolish the system of admixture to mustard of wheaten flour and other articles, which for a long time has been acknowledged by the trade. Out of six qualities of mustard manufactured by them four are guaranteed genuine. The admixtures to mustard need not necessarily be injurious to health. The component parts are, as recent analysis has proved, wheaten flour, pepper, and turmeric; but we see no reason why, as the flour possesses a virtue in itself—another article should be palmed off in its place to deceive the public. The demand for genuine mustard is daily increasing, and we are satisfied that if manufacturers will only encourage it, the public will buy no other. The prosecutions for the adulteration under this Act have been innumerable, and are now of daily occurrence, and we shall give them consideration hereafter.

Reviews.

NEW MODE OF ASSESSING DUTIES.

"Letter to the Right Hon. W. E. Gladstone on a New Method of Assessing the Duties imposed upon Maltsters, Brewers, and Distillers, founded upon the system adopted in Bavaria." London: Printed by Jas. Truscott & Son, Suffolk-lane, E.C.

THIS pamphlet has for its object the introduction to public notice of a new system for assessing the above-mentioned duties, which is an improvement upon the plan adopted in Bavaria, inasmuch as improved machinery is adopted, where it appears that in 1868 the Legislature passed a law that the brewer might crush his own malt at the brewery, and dispense with the attendance of the excise officer by using—affixed to his malt mill—a measuring machine, which measured the quantity crushed as it passed through the mill, and showed the number of bushels upon an index or counter similar to a gas meter index. The measuring machine and malt mill being enclosed in one case, and inaccessible except to the excise officer, the Government decreed that the indications of such index should be taken as the basis for the assessment of the malt duty. The measuring apparatus (the Bolzano-Riedinger Patent) was specified in the Act of Parliament to be supplied by the company who owned the patent. The brewers of Bavaria are adopting the machine almost as fast as it can be supplied, and the duty of the excise officer will shortly be confined to visiting the breweries once in six weeks, taking the indications exhibited by the machine, and making out a charge thereupon, which has to be paid by the brewer within a certain number of days at the Revenue Office. This system in 1872 (since which year it has been more widely extended) saved the Government 600,000 florins, but when universally adopted, a net economy of 2,400,000 florins per annum will be realised. Although the plan is found to work most satisfactorily to all parties, the accuracy of this machine is not up to the standard required by the Government.

At this juncture, says the writer (Mr. Baxter), the managers of the company in Bavaria above referred to heard of my invention of an automatic *weighing* and measuring machine, which exactly supplied the deficiency of the apparatus sanctioned by the law, and after a searching investigation they attached to the invention a very high value. Looking to their experience in these matters, their opinions must necessarily be of more importance than any other person's; and, as a proof of their appreciation, they have undertaken to pay me a considerable sum in order to secure the exclusive license to manufacture and sell the machines in Bavaria, Austria, and Saxony.

My machine, which may indicate weight alone or weight and measure, is intended, therefore, to supersede the one now in use, which is simply a measuring machine. The advantages of founding the assessment upon the *weight* of the malt is confirmed in a curious manner by the action of some of the Belgian brewers, who petitioned their Government last year to impose a tax of 14 centimes per kilogramme upon the malt *or other grain* used by the brewers, in lieu of the existing system. Although the petition was not then granted, the ministers were entirely in its favour, and the promulgation of a law to enforce this plan is only delayed.

Having stated these facts, I will now explain my plan (known on the Continent as the *systeme Baxter*) for a "New and Improved Method of Assessing the Duties imposed upon Maltsters and Brewers":—

1. I propose to repeal the present Malt Duty and the Brewers' License Duty, and, in lieu thereof, to impose a duty of 11·14d. per lb. upon *any* grain, ground or crushed, for the purposes of brewing.
2. To render compulsory the use of Baxter's automatic weighing machine in all breweries and malthouses, affixed to the mills or rolls therein in such a manner that the malt or corn must pass through the weighing machine immediately before or after the grinding or crushing.
3. To regard every person a brewer who shall brew more than 10 quarters (or say 3,120 lbs.) of malt or raw grain per annum, whether the beer produced therefrom be for sale or for his own consumption.
4. To make it incumbent upon every maltster for sale to have a mill or rolls with weighing machine attached for the purpose of grinding or crushing malt for brewing when required, the indications of such machine being taken as charges and paid by the maltster, he having collected the same from the purchaser.
5. To determine that no maltster shall send out less than 10 quarters of malt unground or uncrushed.
6. To compel every maltster to keep a record, open to the Excise anthorities, of the quantities sold and delivered by him, with the names of the persons to whom sold, dates of sale, and whether crushed or uncrushed.

An Act embodying the above rules would, I believe, sufficiently meet the case; and supposing the brewers urge that they are hardly used by being compelled to buy such a machine or machines, they must admit they have a *quid pro quo* in the shape of the removal of the restrictions upon malting and brewing, and payment of duty after use instead of before; in addition to which they would be at liberty to use any description of grain they might choose, malted or unmalted—a great privilege, and one of which the brewers of the beer-drinking countries of the Continent are availing themselves to a great extent.

I respectfully maintain that my system is of great advantage *to the Government* in effecting a considerable saving in the cost of assessment, *and to the brewer* in the removal of vexatious restrictions upon malting and brewing, and the payment of duty *after* the malt is used, instead of before, except in the case of the small private brewer.

As against its adoption there is only one point which can, I believe, be really urged, viz., that the dishonest brewer might get his malt crushed secretly, and might place it in the mash tun without passing through the machine, and that the large amount of the duty is a great temptation so to defraud the Government.

My reply to this objection is that the English brewer is not likely to be more dishonest than the Bavarian; but if he should be, the penalty under the present laws is so high that it would be sufficient to deter any man from risking discovery, and practically there would be immense difficulty in introducing ground corn into a brewery without the flour leaving some trace of its presence. Under the plan now in use for the assessment of the 9s. 6d. duty upon sugar consumed in breweries, the Government runs as much risk of fraud as it would under my system. I am inclined to think that the removal of all restrictions upon malting and brewing, and the deferred payment of duty, would be so highly appreciated by the maltsters and brewers, now that labour, fuel, and barley are rising in price, that they would feel much indebted to any Government which inaugurated the proposed system; and I am also persuaded that it will ultimately lead to a great saving in the Inland Revenue Department. The system allows of the use of unmalted grain, which would to a partial extent result from its adoption.

Of course it is equally applicable to assess the duty paid by distillers.

We consider Mr. Baxter's plan is entitled to the favourable consideration of the Government, though we cannot say that it would be quite right for the Government to absolutely confine the maltster or brewer compulsorily to use Baxter's machine, as that might eternally shut out other inventors; it might be made law that Baxter's machine must be used, unless at any future time some other machine, not being an infringement, should be especially allowed to be used by the Government. We regret that Mr. Baxter has given no details of his machine, and hope he will enable us to lay them before our readers.

THE POLAR WORLD.

"The Polar World: a Popular Description of Man and Nature in the Arctic and Antartic Regions of the Globe." By G. HARTWIG, M.R.P.D. Author of "The Sea and its Living Wonders," "The Subterranean World," &c. Second Edition, with light chromoxylographic plates, three maps, and numerous woodcuts. London: Longmans, Green, and Co. 1874.

UNINVITING as is the aspect of nature in the frozen regions of the North, yet to Englishmen these regions seem to possess charms that more favoured climes do not appear to have. Perhaps this may be owing to the fact that the countries in the high latitudes present to us society in its most primitive aspect, in which we make acquaintance with men who seem to be the brothers of our far-removed progenitors. Moreover, we, as it were, follow in the footsteps of navigators of the olden time, who sought to make what, ere the Suez Canal was dug, was expected to be, a short road for us to far Cathay.

Although this is a second edition, yet the work, being such as we have described it, we could not refrain from saying in its behalf, that, as regards this second edition, the author in the preface shows that the object of the work is to describe the Polar world in its principal natural features, to point out the influence of its long winter night and fleeting summer on the development of vegetable and animal existence; and, finally, to picture man waging the battle of life against the dreadful climate of the high latitudes of our globe, either as the inhabitant of their gloomy solitudes, or as the bold investigator of their mysteries.

The table of contents shows the great variety of interesting subjects embraced within a comparatively narrow compass, which Dr. Hartwig is quite justified in saying he has aimed at presenting in an entertaining form, and tracing the path of discovery to its most recent dates; but, he might have said with great truth, that he had fully succeeded in what he aimed at. At all events, we can say that much for his present production.

Dr. Hartwig fulfils his promise in several chapters, which respectively describe the General Character of Arctic Lands, their Quadrupeds and Birds; the Arctic Seas and Ancient Marine Animals; Iceland, the Icelanders, and the Westman Island; Spitzbergen Bear Island, as to which he states that:—Considering its high northern latitude of 75°, the climate of Bear Island is uncommonly mild. According to the reports of some Norwegian walrus hunters, who remained there from 1824 to 1826, the cold was so moderate during the first winter that until the middle of November the snow which fell in the night melted in the daytime. It rained at Christmas, and seventy walruses were killed during Christmas week by the light of the moon and that of the Aurora. Even in February the weather was so mild that the men were able to work in the open air under the same latitude as Melville Island, where mercury is a solid body during five months of the year. The cold did not become intense before March, and attained its maximum in April, when the sea froze fast round the island, and the white bears appeared, which had been absent during the whole winter. The second winter was more severe than the first, but even then the sea remained open till the middle of November, evidently in consequence of the prevailing south-westerly winds. The greater part of Bear Island is a desolate plateau, raised about 100 or 200 feet above the sea. Along its western shores rises a group of three mountains, supposed to be about 200 feet high, and towards the south it terminates in a solitary hill, to which the first discoverers gave the appropriate name of Mount Misery. At the northern foot of this terrace-shaped elevation, the plateau is considerably depressed, and forms a kind of oasis, where grass (*Poa pratensis*), enlivened with violet cardamines and white polygonums, and saxifragas grows to half a yard in height. The general character of the small island is, however, a monotony of stone and morass, with here and there a patch of snow, while the coasts have been worn by the action of the waves into a variety of fantastic shapes, bordered in some parts by a flat narrow strand, the favourite resort of the walrus, and in others affording convenient breeding places to hosts of sea birds. In Coal Bay, four parallel seams of coal, about equidistant from each other, are visible on the vertical rock walls, but they are too thin to be of any practical use. Bear Island has no harbours, and is consequently a rather dangerous place to visit. During the first expedition sent out from Hammerfest, it happened that some of the men who had been landed were abandoned by their ship which was to have cruised along the coast, while they were hunting on the shore. But the current, the wind, and a dense fog so confused the ignorant captain that, leaving them to their fate, he at once returned to Hammerfest. When the men became aware of their dreadful situation they determined to leave the island in their boat, and taking with them a quantity of young walrus flesh, they luckily reached Northkyn after a voyage of eight days. It seems almost incredible that these same people immediately after revisited Bear Island in the same ship, and were again obliged to return to Norway in the same boat. The ship had anchored in the open bay of North Haven, and having taken in its cargo, consisting of 180 walruses, which had all been killed in a few days, was about to leave when a storm arose which cast it ashore, and broke it to pieces. The Russians had built some huts in the neighbourhood, and the provisions might probably have been saved, but rather than winter in the island the crew resolved to venture home again in the boat. This was so small that one-half of them were obliged to lie down on the bottom while the others rowed. The autumn was already far advanced, and they encountered so savage a storm that an English ship they fell in with at the North Cape vainly endeavoured to take them on board. After a ten days' voyage, however, they safely arrived at Margerö, thus proving the truth of the old saying that "Fortune favours the bold." The distance from Bear Island to North Cape is about sixty nautical miles.

Nova Zembla, Lapland and the Lapps, with notices of travellers such as Castrén, Wrangel, Stellar, and others; Esquimaux and the Hudson's Bay Territories all receive due attention, and form the subject of much pleasant information. The Anarctic regions also come in for their share of attention, but these are not so attractive as the Arctic, and, therefore, do not occupy so much space.

After the insight we have afforded of its contents, our readers, we feel sure, will agree with us that this (like all Dr. Hartwig's works) affords pleasurable occupation in its reading, and at the same time conveys to the mind useful instruction of a scientific kind which adds to the store of truly useful knowledge.

ELEMENTARY CHEMISTRY.

"Elements of Chemistry, Theoretical and Practical." By **William Allen Miller**, M.D., LL.D., late Professor of Chemistry in King's College, London. Revised by Herbert McLeod, F.C.S., Professor of Experimental Science, Indian Civil Engineering College, Cooper's Hill. Part II. "Inorganic Chemistry." Fifth edition, with additions. London: Longman, Green, Reader, and Dyer. 1874.

In our review of the first part of this standard work we took occasion to express our favourable opinion of it, and all we can say of the second part now under notice is simply confirmation of what we previously stated. For in this work, which we may fairly term one of the most important in our language, we find all the facts relating to the science of chemistry brought out in a way that we very rarely find in works professing to teach what this does, namely, the elements. It is a work which every student of chemistry, and others interested in the science should have always at hand. The process of revision, or rather editing, of this edition has, without doubt, fallen into very able hands, and the additions made are such as to bring the ever-progressing field of chemistry up to knowledge of the present day. In the preface the editor enumerates various alterations made in this edition of the work, considerable emendations being made in the order in which the non-metallic elements and their compounds are described with the view to facilitate the progress of the student in the theoretical part of the science by commencing with the elements, which form the least complex compounds, and gradually passing to those which form more numerous and complicated substances, and certain compounds of carbon and sections of gas analysis are, in consequence of their being allied more intimately with organic than with inorganic, therefore reserved for the third part, which will treat upon the organic branch of the science of chemistry. The editor takes occasion to express his thanks to Mr. C. E. Groves, F.C.S., for assistance received for valuable work done in seeing this part through the press when there was danger of its being completely stopped by illness; but we trust that that will not be the case with the forthcoming and last part of the work, which we hope to see shortly issued. In conclusion, we must repeat to everyone engaged or interested in the science of chemistry that they cannot do better than at once obtain this work.

GUN-CARRIAGES AND MECHANICAL WORKING OF HEAVY ORDNANCE.

By Mr. G. W. Rendel, M. Inst. C.E.

The following is the substance of the paper read at a recent meeting of the Institution of Civil Engineers, by the above gentleman:— Owing to the increase in the size and power of ordnance since the introduction of armour, gun-carriages had gradually become elaborate machines, and the appliances for working the monster ordnance now in contemplation would tax all the resources of mechanical science. The first difficulty experienced in mounting the Armstrong rifled guns arose from the much greater violence of their recoil as compared with that of the old cast-iron guns; a disadvantage mainly resulting from their superiority in lightness, strength for strength. A self-acting break for arresting recoil, designed and successfully tried at Elswick, in 1864, by the Ordnance Select Committee, on a 70-pounder timber carriage, was described. The great superiority of wrought iron to timber as a material for gun-carriages was next referred to, and experiments made in 1865 were cited, as showing the error of the popular objection entertained against wrought iron, on the score of its producing, when struck by shot, more numerous and destructive splinters than timber.

Some of the leading types of gun-carriages made at the Elswick works both for naval and for land service were then described, commencing with the plate compressor or recoil break, which was stated to have been adopted almost universally, and by nearly every power in the world.

The series included the 12-ton gun broadside carriage, also the 18-ton gun naval carriage and slide of similar construction, but capable of revolving about a rear pivot as well as a front one, so that the gun might be shifted from one part to another adjoining, and be used in both. The special feature of the plan was the pivoting of a portion of the rack, by which means it could be made available for training the gun in both ports.

This rendered unnecessary the turn-table now used for the same purpose, which was held to be objectionable in a ship, for a large hole had to be made in the deck, the deck beams must be cut and space occupied below, besides which a serious and costly complication in the structure of the vessel was introduced.

In the 15-ton gun wrought-iron carriage and slide for land service, attention was directed to the method of training the platform, and to the substitution for the usual tripping rollers under the carriage of a number of grooved rollers, permanently running on the slide. The training was effected by gear connecting the platform trucks on the front and rear rails in such a way as to drive them at a speed proportioned to the respective radii of the rails. The result was that the platform moved truly about the centre of both rail circles, required no actual pivot, and was trained with ease and rapidity by the simple traction of the wheels. By placing the carriage permanently on wheels, and trusting more to the compressor to arrest recoil, the operation of "tripping" the carriage, *i.e.*, of thowing the wheels into action for running out, was avoided, thus saving time, labour and exposure of men.

By the adoption of mechanical arrangements, for the application of manual power to the working of ordnance, guns up to 25 tons weight could now be worked with more ease, safety and rapidity than guns of a fifth of that weight were formerly. The size of ordnance continued, however, to increase by rapid strides. There were already many rifled guns in existence of 36 tons or 38 tons weight, throwing 700 lbs. shot. Guns of nearly double that weight were actually being made, and there was no manufacturing obstacle to the construction of still larger guns. It was difficult, indeed, to place a limit to the size of gun that could be produced on a system, like that of Sir William Armstrong, under which the gun was built up of concentric cylinders superposed in layers, whose number might be increased so as to form an immense total thickness, without involving any one piece of unmanageable dimensions. The powder pressure attained with large charges would, possibly, first impose a limit on the size of guns; but recent experiments and investigations gave ground for the belief, that even with charges vastly exceeding any yet used, the powder pressure might be regulated and kept within prescribed bounds. Hence, then, the adoption of some inanimate power, in the place of mere hand labour, for loading and working heavy ordnance, desirable as it was for existing guns, became an absolute necessity for guns of the immediate future. The simplicity and compactness of hydraulic machinery, and the perfect control it gave over heavy weights, especially adapted it for the purpose. Hydraulic power sufficient for the heaviest gun might be transmitted through a very small pipe, for long distances and by intricate ways; so that a steam pumping engine might be placed in a fort or ship in such a position as to be absolutely secure, and supply power, by this means, for working many guns. A detailed description was then given of some of the arrangements experimented with, or now in progress, for loading and working guns by hydraulic machinery. These arrangements embraced a new system of mounting turret guns, in which the carriage was dispensed with, and the gun was supported on three points, viz.: on a pair of trunnions placed well forward and on a saddle under the breech itself. The trunnion arms rested in two sliding blocks, which ran in guides on fixed beams, built on the floor of the turret. Immediately behind each block in the direct line of recoil were two hydraulic cylinders for checking recoil and running the gun in or out. The saddle which supported the breech slid along a beam or table beneath it. The front of the beam could be raised or lowered by a hydraulic press to give any desired elevation, but the rear was pivoted at a point corresponding to the horizontal position of the gun; consequently the gun returned always to the horizontal position as it recoiled, whatever elevation it might be fired with, and cleared the port in coming back. Thus the advantage of muzzle pivoting, viz.: the reduction of the size of port-hole, was to a large extent realized without the necessity of lifting and lowering the gun itself.

In the system of mechanical loading for guns mounted in turrets, the gun was revolved and brought to a fixed loading position, where it was sponged and the charge rammed home by hydraulic power. The shot was brought up to the loading place on a small railway truck, controlled by a friction plate, which clamped it to the rails whenever the truck handle was lowered. It was then run on to a hoist, which rose between guides against stops, and brought the shot opposite the gun muzzle ready for being rammed home by the hydraulic rammer, consisting of a parallel tube in which ran a piston and tubular piston-rod. The head of the rammer formed a sponge for cleansing the bore, and contained a self-acting valve which opened when pushed against the end of the bore and discharged a strong jet of water within the gun. A jointed rammer, used for positions where there was not sufficient space for the tubular rammer, was also described. The advantages attained by this arrangement were as follow: The loading operation was transferred from a confined space and exposed position in the port of the turret to a roomy and convenient place on the main deck, where the apparatus was completely protected; the dimensions of the turret were greatly reduced; one man in the turret and one outside might direct and control all the movements of a pair of the heaviest guns, and might load and fire them without other help than that involved in bringing up the ammunition; and, finally, far greater rapidity of fire was attainable than would be possible by manual power. With reference to the necessity the system involved of turning the turret round always to one of two or three fixed loading positions, it was stated that the turrets of the *Devastation* made a full turn in forty-five seconds, and that a railway swing bridge over the Ouse, constructed under the direction of Mr. Harrison, Pres. Inst. C.E., and weighing 800 tons, was turned with almost equal facility by means of hydraulic machinery. It was also stated, as a matter of fact, that the whole operation of bringing to loading position, sponging, loading, and placing again in firing position a 9-inch 250-pounder turret gun, mounted experimentally on this plan, had been effected in twenty-three seconds. The jointed rammer had been successfully applied on a garrison platform. In this case, as the rammer was fixed on the platform, there was no necessity for turning the gun to a definite loading position, and the loading gear and men working it were protected by the parapet. By the present method of loading barbette guns by hand, the men had to mount upon the platform in full view of an enemy, and besides being exposed to shell fire, they became the targets for a rifle fire, which, owing to the precision and range now attained with rifles, would render it difficult to keep guns in effective action under such circumstances.

In suggesting another plan for the application of a hydraulic system of loading in casemates, it was stated that there was no doubt more difficulty in the adoption of mechanical loading in existing casemate forts than in turrets, or open earthworks. The size of artillery had so outgrown that of the existing forts, during the long time necessarily expended in their construction, that 38 ton guns had now to be mounted, if possible, in batteries originally intended for 12½-ton guns. But this fact made it only more imperative to dispense with manual power, because the larger guns, while they further restricted the already limited space, required larger crews. The service by large numbers of men of heavy guns closely ranged in confined casemates, tier upon tier, might lead to serious confusion in the heat of action; and the necessity of crowding men in time of war in isolated forts was of itself a grave evil. By substituting hydraulic for manual power for working the guns, nine-tenths of the men might be dispensed with, and the work might be done more coolly, rapidly, and efficiently. Rapidity of fire was nowhere of greater importance than in the case of guns designed to prevent the passage of swift steamers past fixed batteries; and economy of men was a vital consideration in the defence of a coast so extended as that of the United Kingdom. It was said that already far more guns were mounted than could be manned. Modern artillery could only be worked with highly trained men, whom it would be impossible to produce upon short notice. Nor could the present small force be made effective by activity in shifting men to threatened points, for the attacks of steam fleets would be sudden and unexpected, and could only be met by preparation at all points.

The introduction of an effective system of mechanical loading had an important bearing on the question of the comparative merits of breech and muzzle loading, because it enabled a gun, however long in the bore, to be loaded at the muzzle with at least as great facility as at the breech, while dispensing with the complications of breech mechanism and the time required to work it, both of which became important considerations in the case of monster ordnance.

The principle of sinking guns entirely under cover from horizontal fire behind any sufficient parapet, and raising them only to deliver their fire, possessed the great advantage of making earthwork defences available. All defences must yield to continued attack; and an iron fort when seriously injured could scarcely be made good before the end of a war, and only then at great cost. It was the especial merit of earthwork, that it might be easily strengthened and adapted to new circumstances, and that it might be repaired almost as fast as it was destroyed. In the two forms of gun-carriage, adapted for this system of protection, which had been proposed by Major Moncrieff, the principle was the storing and utilizing of recoil in the one case by the raising of a weight, in the other by the compression of air. The economical value of the utilization of recoil was insignificant where steam power was available. The main object to be attained by the utilization of recoil was to make of each gun-carriage a machine complete in itself, and independent of any connection with other machinery for producing the required power. In a system, however, of hydraulic gun-carriages, supplied with power from steam pumps, the connection between the carriage and the source of power was of the simplest kind, consisting only of a small pipe, which might be furnished with a stop valve, and thus enable the power to be turned on or off, with nearly as much facility as a jet of gas. As there was no limit to the amount of power that might be conveyed, so there was no restriction of the height of cover obtainable—an important point in the employment of earthwork as a protection for guns, since the crest of the parapet might easily be cut down by the enemy's fire. A drawing was exhibited of a 12½-ton gun mounted under cover of earthwork so as to be raised to the firing position by hydraulic power, and the advantage of using a power independent of recoil for raising the gun was illustrated by the height of cover obtained. A working model was also exhibited of a 38-ton gun similarly mounted, as designed for the upper deck barbette battery of H M.S. *Téméraire*—a vessel which, being intended for ocean cruising, and provided in consequence with masts and sails, required a high deck and could not carry a revolving turret.

The Paper was elaborately illustrated by diagrams, and, in addition, by working models of hydraulic mechanism.

CONFERENCE ON THE PATENT LAWS.

At the meeting of the Inventors' Institute, March 19th, 1874, Sir A. Brady, Chairman of the Council, presiding, the **Chairman**, after stating in general terms what were the objects of the meeting, observed that in this country few domestic questions were of greater importance than the improvements of the Patent Laws, and it is with the view to take steps to induce the Government to adopt efficient measures of amendment that the meeting was held that evening to consider what the Institute was to do in the matter. Recently he had been one of a deputation that waited on the late Lord Chancellor (Lord Selborne) to lay before him the abominable state in which the so-called Patent Museum at South Kensington was kept, who when the matter was placed before him was so struck with what he and others had brought under his notice, that he said he would rid himself of the responsibility on his shoulders as quickly as possible The same objectionable character applied to the law of patents in this country, and he considered there was no doubt whatever that the law ought at once to be put upon a satisfactory footing; and any man, if he went thoroughly into the question, would agree with him that the time had arrived when the Government should take the matter up. At this moment a patent is granted provided you pay the fees, and there is no real inquiry into the question whether a patent had been granted before for the same invention; for, so long as you are ready with the cash, you have your patent. And, supposing the patent is infringed, you are left to fight it out without even a *prima facie* presumption of validity, so that in fact a patent means simply a right to go to law, and an invitation to all men to drag you into lawsuits. Now, the great point should be to render every facility for getting a patent where there is any just claim to one, therefore the first thing should be a reduction of the fees; and, further, all patents should be indefeasible. Also, a patent should not be granted a second time for the same thing, as under the present state of the law is repeatedly done; hence preliminary examination is necessary. The time was fully come when this subject should be taken up in earnest, and that something should be done in order, if possible, to get a Bill into Parliament during the present session. The subject is one interesting all, and especially was it of importance to the working man. In fact, he thought it essentially a working man's question. He would be glad to have the full and free expression of the opinion of the meeting on the question.

The **Secretary** then read various letters from the members who were unable to be present, and in each case it was stated great improvements in the law were necessary, especially in regard to reducing cost of patents, and, after reading the correspondence, Mr. Campin (the Secretary) took occasion to refer to the action that had been taken by the Council of the Institute in reference to the Patent Laws, alluding to the Inventors' Right Bill, and also to the report of the Committee of the Institute in reference to the House of Commons report. (See SCIENTIFIC AND LITERARY REVIEW, January and Feburary, 1874.)

Mr. PATERSON said that he quite agreed that there should be a reform in the law, and that the reforms advocated by the Institute should be carried out. One great reform, he thought, should be in the mode of printing and publishing the specifications, and also, as a very great essential, there should be a complete assortment of abridgements, so that a man, if he wishes to patent an invention, may first of all, before spending his money, be able to find out whether his invention is new, for, he was sure, under the present system, it was utterly impossible for anyone to search with the hope of finding out anything of the sort. Now, in regard to this, he considered the system adopted in America should be also adopted here, for there you have all that is required in regard to these essentials, and besides in that country they have a most magnificent museum arranged in good order so that an inventor may see whether his invention is new or not. A very great difficulty in the way of every poor inventor now was, that the fees were too high for him to think of his getting the benefit of his brains, and he therefore thought that a considerable reduction was necessary in order to make the law as applicable for the poor man as for the man that has capital; and, further, that instead of paying down the lump sums at the end of the third and seventh years, an annual tax, commencing at the end of five years, might be adopted. He thought that the time for action had now arrived, and that an appeal should at once be made to the Government, with the view of getting some alteration during the present session of Parliament.

CAPTAIN SELWYN observed that he had taken great interest in the questions relating to Patent Law, and, amongst other things, he held that patents should be indefeasible, and he also held that property in invention was as much a necessary part of true law and order as all other property. He considered that a man, without the means of paying the exorbitant fees now charged, should be placed on the same footing as a man with capital who would not scruple to rob the poor man of his invention. This country, as regards invention, presents a remarkable contrast to America, where an inventor is taken by the hand to be led to success; whilst the fashion here in England is that he is taken by the throat and robbed, for if, perchance, the man with capital takes an inventor by the hand, and says "I will get you a patent;" when he has got hold of the invention he is, in this country, free to take it, and thereby rob the real inventor. Where inventors are encouraged, as in America, patents are increasing at a great rate, the number granted being over three times that in England, and also in America by reason of its passing through the hands of the examiners, you may reckon on the novelty of the invention. That is not the case here where you take patents at your own risk and chance if they have not been patented before. As regards what had been proposed by some persons, namely, to give state rewards, he thought that the system as at present practised was bad, seeing that within the last few years large rewards for inventions had been awarded, and that money had in some instances been thrown away by reason of the inventions having been superseded or declared useless. Under a proper system and conditions, state rewards should be given to inventors. The mode of obtaining a patent required great revision, for the law should be such that a poor man might, for a nominal sum, have a patent, on his proving his invention to be new, which could be done by adopting something like the American system. A patent once obtained, it should be indefeasible; and, therefore, he was for patents being cheap and indefeasible. In dealing with this subject it behoves statesman not to forget that in these days of competition foreign nations are running us hard in the race, and, therefore, the importance of this question is very great to this country, where the national prosperity rests so greatly upon industrial progress, which means nothing more nor less than the progress of invention.

Mr. MACOMBER, after reverting to the remarks of Captain Selwyn, with whom he entirely agreed, proceeded to show by statistics the great encouragement offered to inventors in America, where a moderate fee is charged for the patent, and where a patented invention may generally be relied upon as being novel, for if not the patent is almost certain of being refused by the examiners. The patents applied for in 1872 were 19,587, and those passed by the examiners were 13,626, so that rejections for want of novelty and such like questions, numbers no less than 5,961. After further remarks on the superiority of the American over the English law, he stated that he was of opinion that a considerable reduction was necessary in obtaining a patent in this country.

Dr. HASELTINE concurred with Mr. Macomber.

Mr. NETTLEFOLD observed that he thought inventors were too much taxed, and that the expenses in getting a patent should be small, and, also instead of the lump sums having to be paid, as now, a small annual tax should be substituted.

Mr. EVAN LEIGH said he thought they were all agreed that patents ought to be rendered cheaper in the first instance, so that a poor man may be able to get a patent as well as the rich man, and that some such system should be adopted as in America, that no patent be granted but to the real inventor. No tax should be imposed for, say, the first five years, but, after that, an annual tax might be imposed.

Mr. G. SAVAGE, speaking from a working man's point of view, said he considered that this was a question in which they were deeply interested, and he was certain that they were entirely in unison with the propositions advanced by the Institute. In the first instance, it was essential that the law should be brought within the sphere of a working man, and this could only be accomplished by making patents cheap in the outset. It must be a matter of shillings, not of pounds, so that a working man might reap the benefit of his brains. At present a working man was entirely out of the question in getting a patent, the high fees barring him; being made, he would suppose, for the purpose of feeding hungry lawyers. He had had a great deal to do with this question, for he had been connected with exhibitions in which the inventions of *bona fide* working men had been exhibited, and he could say that, as a rule, in very rare instances have they reaped the benefit of their inventions. Mr. Savage gave his experience as regards the working of the law at present, and concluded by saying that he thought strong representations should at once be made to the Government with the view of having the law amended, and he felt convinced that they would have a fairer hearing from the present Government than from the late one.

Mr. SOFUS HOLTEN agreed generally to what had been put forward that evening, and that the law ought to be amended. He agreed that something like the American law ought to be adopted, but there was one thing he could not agree with, that a model should be compulsory, as some models cannot be made under a considerable sum. He was in favour of patents being indefeasible.

Mr. MACOMBER asked what was the amount of surplus taxes on patents in this country?

Sir A. BRADY observed that the sum was about £80,000 a year, and that the whole amount was something over a million of money.

Captain SELWYN, in consequence of an observation by a member, stated that he advocated compulsory licences only, where it was found that the owner of a patent could not meet the public demand.

Mr. A. J. MURRAY observed that he always had been opposed to compulsory licences, but where it was found that the patentee did not meet the demand of the public, then, he thought, under certain restrictions the suggestion of Captain Selwyn ought to be adopted, and in this view of the case Mr. Leigh also concurred.

Mr. VARLEY proposed a vote of thanks to the Chairman, to whom he said the Institute was much indebted for forwarding the great work they had advocated that night, in the way he had done in connection with this Institute for some years past. He would also take this opportunity of expressing his feelings with regard to the services rendered to the Institute by Captain Selwyn, in the prosperity of which he had taken an active part for so many years. He was quite sure that the meeting would pass the vote of thanks to the Chairman with acclamation.

Mr. CAMPIN, in seconding the resolution, remarked that as Secretary, he was in a position to know how much the Institute had been advantaged by the services rendered by Capt. Selwyn and the Chairman.

The vote of thanks having been passed, Sir A. Brady briefly responded, and the meeting closed.

PATENT BARREL HEAD.

An ingenious device for enabling barrel heads to be readily removed and repaired, without taking off the hoops, is described in a recent issue of the *Scientific American*. The head is made in three parts, 1, 2, 3, the jointed edges of which are beveled off (sections 1 and 3 on the top side and section 2 on the lower side) so as to form a solid head both as to inward and outward pressure, when a metallic plate is properly affixed. The middle section 2, is of V shape, and its wide end enters the croze or grove, while the point reaches near to the opposite side of the barrel, and is held in place by a plate, which is secured by screws to sections 1 and 3. To remove the head from the barrel, one of the screws is withdrawn and the plate turned on the other screw until it clears section 2, when the latter is easily removed by the thumb and finger inserted in notches near the end. To place the head in the barrel, the above operation is simply reversed. Patented by Mr. Alexander Hanvey, of Steubenville, Ohio.

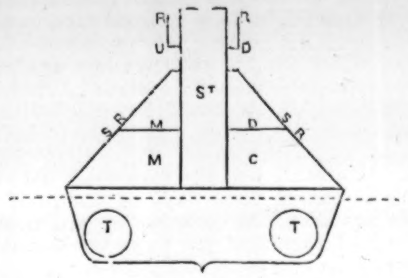
FIRE SUPPRESSION.—In our report of Mr. P. A. Blake's paper on this subject, read at the Inventors' Institute members' meeting, on Feb. 19th, there is a typographical error, which makes the cost of applying Mr. Blake's invention to be £5; it should be *five shillings*.

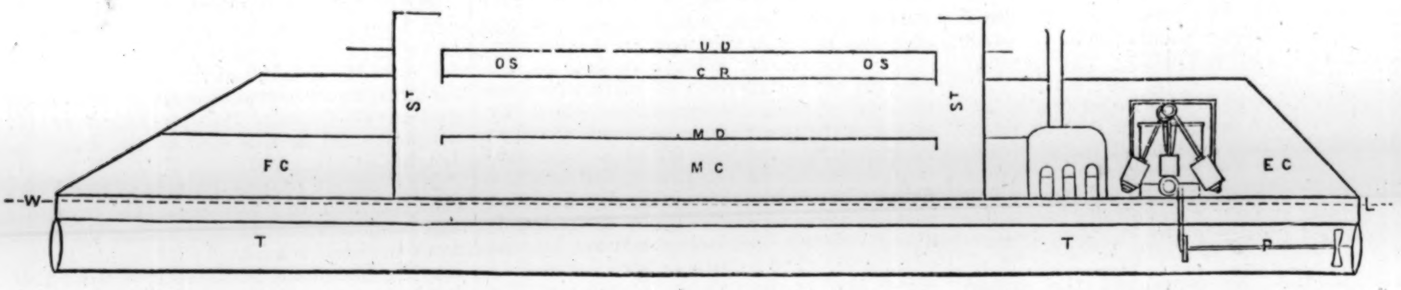
Messrs. Chatto and Windus, publishers, Piccadilly, W., announce the publication of "The Cyclopædia of Costume; or, a Dictionary of Dress, Regal, Ecclesiastical, Civil, and Military," from the earliest period in England to the reign of George the Third, including notices of contemporaneous fashions on the Continent; and preceded by a general history of the Costumes of the principal countries of Europe, by J. R. Planché, F.S.A., Somerset Herald.

Messrs. Dean and Son announce for publication immediately after the assembling of Parliament, "Debrett's House of Commons, and the Judicial Bench," which will be edited by Robert H. Mair, LL.D.

ANTI-WAVE SHIPS

By Dr. W. S. Carmichael.





The following is the substance of a paper by the above-named gentleman to be read and discussed at an early meeting of the Inventors' Institute:—

Gentlemen,—I am happy to have this opportunity of bringing my invention before a body of scientific men, able and willing, I doubt not, to estimate scientifically the proposed innovations, unbiassed by the influence of time-honoured usages.

My invention is intended to modify the influence of the waves, &c., by covering certain generally exposed parts of vessels, and thereby to lessen the dangers and inconveniences of the sea. It consists of one general principle, viz., the defence of certain generally exposed parts of vessels by a covering.

1st The defence of the sides and decks by sloping roofs, thereby enabling the vessel to retain a more horizontal position, and abating the dangers and inconveniences of the sea.

2nd. The defence of the screw or screws by a covering, thereby saving it or them from shot, &c., and enabling it or them to act with more effect.

It consists of a hull up to the water level, W L, somewhat like that of other vessels, except that the keel is straight and horizontal, the bow perpendicular, and it is perforated by one or more openings to be afterwards described. I propose that the vessel shall be nearly flat-bottomed, the sides below the water level nearly perpendicular, and also that the heaviest parts shall be on the outside.

Near the water line, W L, or several feet above it, according to the size of the vessel, the sides all round slope inwards, become a sloping roof S R over the cabins, M C, F C, E C, and main deck, M D, &c., at an angle of 45°, more or less, forming a breakwater on which the waves in rough weather may harmlessly expend their force, instead of dashing against nearly perpendicular sides, or washing the deck. These sloping roofs at the front of the vessel meet and form a sharp ridge, by which a wave at the front is cut in two.

The upper part of this sloping roof S R may be made mostly of sliding panels, which may be pushed aside in calm weather, so as to render the main deck, M D, at such times nearly as open as in other vessels. Of course in the harbour these panels will always be drawn aside, so as to leave room for the entrance and exit of passengers, &c., the carriage of luggage and cargo, &c.

Seven feet, more or less, above the main deck, M D, the sloping roofs end in a flat roof, G R, to allow the more violent waves to pass harmlessly from windward to leeward; and, by being partly glazed, to give light to the decks below. The cabins below may also be lighted by the usual bull's-eyes.

Three or four feet, more or less, above the partly glazed roof, there is a smaller upper deck, U D, about half or a third of the size of the main deck, for captain, pilot, &c., and from which the vessel may be steered. This is supported on iron rods, braces, &c., not represented in the illustrations, and also by having a round enclosed staircase, St., at each end, leading down to the decks and cabins below. I think this upper deck should be surrounded merely by a light railing, R, so as not to catch the wind.

The moving power is generally one or two propellers, P, within, or immediately behind, one or two tubes, T T two to eight feet in diameter, more or less, extending from stem to stern. If, on account of friction or other cause, these long tubes be found inexpedient, I propose two shorter tubes near the stern, either passing through part of the vessel, or altogether on the outside; or, finally, one tube from the stern with a branch passing through each side.

By such means I expect that in calm weather such a vessel will advance through the water pretty much like other vessels, perhaps a little faster. That in rough weather the waves will rush harmlessly up the sloping roof and through the open space, O S, to leeward, and that the windward side of the vessel will not be so inconveniently raised, both on account of the heaviest parts being on the outside, and on account of the shock of the waves being received on a sloping roof, which will cause that part to be depressed rather than raised; and my object is so to balance these forces, by varying the angle of the slope if necessary, as to keep the vessel steady.

I expect, also, that the bow, by modifying the slope if necessary, will advance straight through a wave, instead of rising over it, and thus that the vessel will remain much more steady than is usual; and, as there will be less pitching, rolling, &c., that foundering and sea-sickness, and other dangers and inconveniences will be less likely to occur, and as its course will be shorter, passing through instead of over the waves, that it will also be more rapid.

An open space for the waves to pass through, and a high deck beyond their reach, is an old idea of mine, revived by the late discussions about the means for preventing sea-sickness.

I expect, also, that as the water reaches the screw more directly, this will have more power; that the loss of power from slipping will not be so great; and that the screw will act more as if it were rotating in an unyielding substance, or pumping the water from stem to stern.

The screw will also be less exposed to danger from ropes, chains, torpedoes, shot, &c.

This is also an old idea of mine, revived by some late newspaper notices about the danger to which the screw, especially in war vessels, is exposed.

When the wind is favourable, water sails may be used, or other sails with jury masts.

I think that flat-bottomed boats built on this plan might be useful for landing passengers through a surf as at Madras, and a modification of it for life-boats. In these cases a screw driven by a small steam engine or strong arms would be necessary. Such a plan might enable fishermen to bring themselves and cargo home in safety, instead of losing both by being swamped in a sudden storm. Such a plan in sailing vessels might save sailors and deck cargo from being washed overboard, as sometimes happens, and the vessel itself from foundering. In this case a high deck would be necessary, either on the top of the sloping roof, or made by connecting the fore, main, and mizen tops, or by both plans.

When I explained my invention to a friend of mine here, he said to me derisively, "Would you have your vessel lie on the surface of the water like a log of wood?" He expressed my intention almost exactly. I would have my vessel, in rough weather, lie on the water, or rather advance through it, like a log of wood sharpened at the front, the water washing every exposed part of it except the high upper deck. Taking this view of it, there seems to me some similarity between it and the catamaran of Madras; this is merely three logs lashed together, upon it one, two, or three men kneel, and paddle through the surf when no other craft can venture. In this case the catamaran and the legs of the natives washed by the waves may represent the body of my vessel and its roofs; the heads, bodies, and arms of the natives may represent my upper deck and its occupants.

Another objection is that a violent storm would soon wash away all my sloping roof. This is easily answered; the first six, eight, or ten feet above the water line must be made as strong as the bulwarks, or rather the sides of other vessels. Beyond eight or ten feet the force of the waves is not against the sloping roof, except the mere weight of the water, but obliquely upwards at the angle of the slope, and I would have the movable panels only about six, eight or ten feet above the water level.

The engraving is meant to represent a transverse vertical section through the after staircase St, and a longitudinal vertical centric section, both about 1-300th of real size, one inch representing about 25 feet.

T T, tube or tubes for propeller or propellers; W L, water level; M C, F C, E C, main, fore, and engineers cabins; M D, main deck; S R, S R, sloping roofs, the bow and stern sloping roofs not lettered; G R, flat roof, partly glazed; O S, O S, open space for waves to pass through below upper deck; U D, upper deck; R R, railings round upper deck.

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ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

Chairman of the Council:

SIR ANTONIO BRADY.

NOTICES.—SESSION 1873-4.

Attendance of Members and their Friends is requested on—

THURSDAY, April 2nd.—Patent Law Conference.

THURSDAY, April 16th.—On "Construction of Iron War-ships and Fort-faces." By R. BELL, Esq., C.E., F.R.I.B.A.

THURSDAY, April 30th.—On "Improved Cooking and Heating Apparatus for Peat and other Fuel, with Suggestions for Food Reform." By Mrs. A. LEWIS.

Meetings commence at 8 p.m.

TO MEMBERS OF COUNCIL.

Council meetings to take place at 7 p.m. on same evenings.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

At the meeting of Council (ordinary) held March 5th, 1874, W. Yates, Esq., in the chair, the minutes of the last meeting having been read and confirmed as correctly entered, the Secretary reported that Mr. Jonathan Newall requested the opinion of the Council on his invention, of which he had forwarded a descriptive statement. This being read, it was referred to Mr. F. H. Varley and the Secretary to act as a sub-committee to examine into the matter, and report to the Council.

It was resolved that at the next Council meeting the first business should be the course to be taken by the Council with regard to Patent Law Amendment, and that the Secretary should in the meantime call the attention of all the members to the present state of the patent question. (This has been done by the notice to members of the Institute, which appears in another column, being sent to each member.)

Members recorded—Messrs. W. E. Debenham, Dillwyn Smith, King, Roman, M. Samuel, Fear, W. H. Davies, A. M. Silber, A. Heatherington.

At the meeting of Council (ordinary and special) held on 19th March, Sir Antonio Brady, the Chairman of Council, presiding; after the reading and confirmation of correctness of minutes, it was resolved that, in order to place the Institute in a better position to carry on efficient action with regard to Patent Law Reform, it seemed desirable to make some changes in the rules. A committee was, therefore, appointed to consider what, if any, alterations could be beneficially made in the rules and proceedings of the Institute.

The accounts of the Institute were also ordered to form the subject of special business at the next meeting of the Council.

Members recorded—Messrs. W. L. Anderson, Jas. Webster, M.E., Geo. A. Teulon, John C. Peacock, J. B. Orr, T. Sheeham, J. Harvey, G. Coates.

At the members' meeting held on 5th March, 1874, Mr. F. Varley (Chairman of ordinary Council or Executive) presiding, Mr. T. Vafea read his paper "On Raising Sunken Ships," and this, with discussion thereon, will be hereafter reported.

At the members' meeting on 19th March, Sir Antonio Brady (Chairman of the Council) presided; at the conference on the Patent Laws and the report of the proceedings thereat will be found in another column.

Monthly Notices.

H.M.S. Challenger is stated to have arrived at Melbourne. She has visited Kerguelen Land and Heard, or MacDonald, Island, and attained a latitude of nearly 66½° south. By the next mail we may expect, says the *Athenæum*, some interesting details of this part of her scientific voyage.

Absorption of Ammonia by Plants.—At the meeting of German men of Science at Wiesbaden, amongst others, M. A. Mayer gave an account of his experiments to determine the power possessed by plants to absorb ammonia *above* the surface of the ground, the general result being that the healthful growth of the plant was interfered with if the introduction of ammonia by the roots was prevented.

Decolorising the Diamond.—At the same meeting M. Flight described some curious experiments on the influence of heat and light on the colour of the diamond. Diamonds of a yellow colour, from the Vaal river, lost their colour when heated to redness in a current of hydrogen, and remained colourless when cold in the dark. If exposed to light they gradually recovered their colour.

Indian Coal.—Mr. F. R. Mallett, of the Geological Survey of India, is reported to have discovered coal of good quality near the Darjeeling hills. The seams are said to be of considerable thickness.

Dr. Arnott, well-known in connection with the invention of the Arnott's Stove and Ventilator and the Water Bed, died on the 2nd March.

Photographs of Interference and Detraction Phenomena, obtained by receiving the shadows, &c., on prepared plates instead of on an ordinary screen, and then projected on the screen of the lecture-room by means of a lime light, have been exhibited by Professor Clifton, in illustration of his lectures at the Clarendon Library, Oxford. The impression on the sensitive plate was sometimes magnified to 2,500 diameters. The Professor considers that similar photographs had not before been made available for lecture-room purposes.

Poggendorff Jubilee.—A special Jubilee Volume, dedicated to Johann Christian Poggendorff, is about to be issued by the editor's friends, in recognition of his long-continued services to scientific literature, the famous *Annalen der Physik und Chemie* having now been in existence just 50 years.

The Monthly records of Results of Observations in Meteorology, Terrestrial Magnetism, &c., taken at Melbourne Observatory during July and August, 1873, are to hand.

We regret to hear of the death of Dr. Forbes Winslow, the author of many works on lunacy, and for many years editor of the *Quarterly Journal of Psychological Medicine*.

Laws and Courts of the United States.—Of remarkable interest to the curious reader, as well as of great use and value to lawyers, notaries, commissioners, collecting agents, and business men, on both sides of the Atlantic, is a new volume, edited by Mr. Horace Andrews, A.M., of the New York Bar, and published by Andrews, Gibson, and Bateman, in the same city, their London representatives being Messrs. Stevens and Haynes. This "Manual of the Laws and Courts of the United States, and of the several States and Territories, with a directory of reliable Practising Lawyers," is a practicable tribute to the recent rapid extension of business relations between England and America. Ignorance of peculiar local statues has hitherto been the stumbling block to safe legal contracts made in this country with respect to any district of the United States.

Late High Tide in the Thames.—With reference to the late high tide, Mr. R. Taylor proposed at a recent meeting of the Metropolitan Board of Works, that the Chief Engineer should report upon the possibility of preventing the overflow of the Thames in future. Mr. Runtz believed the only way to meet the evil would be to extend the southern embankment lower down the river. Ultimately the Chief Engineer was directed to consider the subject and report to the Works and General Purposes Committee.

New Work on the Moon, by James Nasmyth, C.E., and James Carpenter, F.R.A.S., in which the Moon is considered as a Planet, a World, and a Satellite, with twenty-four illustrative plates of lunar objects, phenomena, and scenery, and numerous woodcuts, has just been published by Mr. Murray. As the space at our disposal in this number does no permit us to give such a review of this excellent work as it deserves we are reluctantly compelled to reserve it for a future opportunity. We may, however, remark that the work is one that should be in the hands of all who take an interest in Astronomy and Science in general.

THE CONDITIONS OF MENTAL ENERGY AND MENTAL INTERCOMMUNICATIONS.

By Delta.

A thought or will is conceived in the brain, how it matters not here, and is propagated to the external world chiefly in five ways.

These are—

1st. By means of the voice; a mechanical disturbance of the atmosphere, whose waves break on the tympanum of the ear, and the impressions formed by the shock of these atmospheric billows, are transmitted by the auditory nerves to the brain.

2nd. By manifestation of power in the arm and hand imprinting certain marks or characters on paper which are presented to the retina on which they are reproduced, and thence conveyed by the optic nerve to the brain.

3rd. By a similar process, but the interposition of an electric.

4th. By gestures communicating themselves to the brain as in the 2nd and 3rd cases.

5th. By exchange of expression between the eyes.

Of these five methods, the first three are alone adopted to the interchange of complicated ideas, but in each there exists a certain interval of greater or less duration when the thought consists solely of a mechanical motion either of the atmosphere or according as it finally presents itself to the auditory or the optic nerves.

Let me be more explicit. There exists during a certain infinitely small period of time a condition of molecular disturbance solely, and during this interval it is conceivable that there are limits in space between which the molecular disturbance is occurring—limits which isolate it in space.

For simplicity, let us take the case of a gun fired at a distance. The flash is seen, and in the immediate neighbourhood of the discharge the report is synchronous aimost with the flash. But at a considerable distance this is not the case. The sound of the explosion does not strike a distant ear for some seconds, even minutes, after the occurrence of the phenomenon it announces. It is contrary to the known laws of the propagation of sound in elastic media that the whole of the intervening space should exist in a state of molecular disturbance at the same instant, time being necessary for the transference from atom to atom or molecule to molecule of the motion.

The bounding surfaces progress in space, and it is not necessary that these should even travel at the same rate. The volume of matter throughout which the disturbance occurs may be continually increasing, but the velocity of the atomic or molecular motion is decreased.

The total *vis viva* remains constant, and the isolation of the disturbance is complete.

We are apt to hear the expression "as quick as thought," but this can alone refer, strictly speaking, to the conception of the thought, its propagation being entirely dependent for rapidity on the medium whose atoms transmit it.

Thus thought, in its transmission from one mind to another, is subject to the same laws of rapidity of transmission and depreciation under the law of inverse squares as any other attribute of the material universe.

It may be true that the same thought flashes across two minds apart occasionally at the same instant, but as it is the result, I think we may conclude, of some influences exterior to both minds, it cannot afford the basis of an argument for the absolute instantaniety of the transmission of thought.

So far then, perhaps, we may conclude that we have cleared our way, and admit the proposition that thought during its transmission from one mind to another consists of a mechanical motion of the atoms or molecules of the medium in which it is propagated, and is subject to the laws of that medium whether it be the ether pervading space, the atmosphere, or a telegraph wire.

This subject as we advance is one whose difficulties continually increase; we are dealing with a subject on the very confines of the knowable, and have no experimental lights to guide us through the almost untrodden paths we would follow, and the difficulties which surround us magnify themselves in the dim twilight, yet we have accomplished something towards a point where, with the bright daylight of experiment to help us, we may tread with surer steps.

We have done something, I think, in opening up a field for contemplation; shadowy fancy painted pictures beyond the boundary line.

But the task we propose is to bring, if possible, lights into the region as yet untrodden, and leave the tempting, yet dangerous, darkness till, at least, we have established one undisputed right of way to the debateable ground.

Here, then, is the problem which presents itself for solution—To determine the mechanical energy of thought during its propagation in a given medium. Let us face it calmly, taking for our motto "*nee aspera nec terrent*;" humbly, too, for we must tread with uncertain steps and slow.

At the very outset we must feel our way. We must ask ourselves if we are justified in assuming the *vis viva* of the disturbed medium to be an exact equivalent of the mental energy expended. It is not an easy question to solve, but we have the great principle of the conservation of energy to assist us. If this grand principle is universally true, we may answer the question in the affirmative, and we change our base of operations to one which rests on whether the principle of the conservation of energy be true universally or not.

The assumption that it is true universally, and, therefore, in the particular case under our consideration is one, I think, we are justified in making. But, I think, we may even assure ourselves that the principle holds good even without the assumption.

We will attempt to do so very cautiously.

A thought, while it exists solely as a mechanical disturbance of the atoms of the propagating medium, is clearly intact; for it exists neither at its source whence it sprang, nor at its ultimate destination which, as yet, it has not reached. It is complete and capable of being viewed in the imagination as isolated and in this form consists of the disturbed atoms in every possible phase of vibratory motion. The transference of motion from atom to atom is successive, but there is no translation of the atoms themselves beyond their own periods of vibration, and a series of these vibrating atoms constitute in all their possible phases a wave. Here we are simply travelling over well-explored paths, but it is, I think, necessary to dwell yet a little on this conception of thought in transference thus isolated.

We may conceive it as being transmitted through a very long tube, air being the transmitting medium. We may view it as being at any given instant at a certain portion of this tube, so that we may cut it off by imaginary bounding planes, and enclose it completely. Between these planes all is in various stages of molecular disturbance; without them there is a state of rest.

The thought then is complete in the motion of the atoms of the medium transmitting it. And in this condition it has attributes which are those of the transmitting mediums, and is subject to all laws to which that medium is subject. Its fate is completely bound up, in fact, with that of the medium, its existence being nothing more than a succession of phenomena presented by the phases of the atoms of the medium.

It may be urged that the work done in writing a particular letter is no guage of the work done by the mind in evolving that letter, but if it be true that the principle of the conservation of energy holds universally it does so in the particular. This, I think, we have established.

But this principle holds if we conceive of the action occurring through two or more transmitting media, as, for instance, in the case of musical sounds, first transmitted by wooden rods, thence to a sounding box containing an elastic gas, such as air.

We have, in fact, the principle holding true in the various stages of the transmission, however numerous they may be. It is, in fact, true, for $n \times 1$ terms if true, for n terms, and that it is true for n intermediate terms, we have, I think, sufficiently shown; and, therefore, for its terminals. I think, then, we may take it that the work done is exactly guaged by the *vis vira* of the transmitting atoms,

When an important communication is received it reproduces in the recipient mental energy, the exact equivalent of the original mental force expended, and this mental energy may present itself again in a mechanical form. It is true that the conception of a thought by the consumption of brain-matter by oxidation probably performs side work on the organ of memory, but this is not the thought in transference to another mind foreign to the mind in which it had its origin.

How often the happiness and destines of nations have hung on the mechanical motions of the atoms of a transmitting medium! How often the sudden incarceration, perhaps, of these disturbed atoms or the compulsory breaking of their tiny waves on the shores of a rocky medium incapable of transmitting their feeble shock might have saved the sorrows of a cruel war.

ROADS IN MOUNTAINOUS TROPICAL COUNTRIES.

By Major James Browne, R.E,
Assoc. Inst. C.E.

The object of this paper, which was read at the Institution of Civil Engineers on 3rd March, 1874, was to put on record precautions found necessary whilst making roads among the Himalayas at elevations reaching up to 24,000 feet; where the annual rainfall in some districts amounted to 220 inches, of which 170 inches fell in the two and a half months of the rainy season, and 5½ inches in one hour. Mountain roads could be divided into two classes: those which crossed the main or higher ranges, and those which crossed the lower or subsidiary ranges. The latter class generally presented the most serious engineering difficulties, owing to the greater quantity of water to be encountered. In the higher ranges, the soil, being mainly composed of hard rock, did not allow every little stream let to cut for itself a deep and ever-increasing chasm, as in the comparatively soft soil of the lower ranges, and this circumstance rendered the bridging an easier matter. At elevations exceeding 8,000 feet attention must be paid to the action of the snow in winter. The best approach, in an engineering point of view, to the station of Dalhousie was through a ravine, so sheltered from the sun, that the snowdrifts remained unmelted for weeks and barred the way; and it had been found necessary, in consequence, to take the new cart-road through otherwise very unfavourable ground. At Roksur, in Lahoul, a road well traced, but laid out in the height of summer, was impassable for the three spring months from incessant avalanches; one of which, ½ mile in length, and exceeding 100 feet thick, carried off a stone bridge of 40-feet span, and remained unmelted for more than six months.

In marking out the formation level, cuttings exceeding 10 feet or 15 feet in depth should as much as possible be avoided. In the stony soil of the hilly country no reliable information was to be got by boring;

and rock of the toughest and hardest description sometimes cropped up where least expected. In the Himalayas, the northern slopes were thickly wooded, where the southern slopes were often quite bare. The former should be selected, notwithstanding the increased labour of tracing through the brushwood, as the road would be more durable. The trees broke the force of the rain, and the mould beneath passed it off gently over the road, which, on the bare hillside, would be cut away by the unchecked rush of water.

The general adoption of zigzags was not to be recommended; but much had been said against them which was open to modification. They entailed incessant repairs, if used in a wrong place—where the side slope was steep, the soil rotten, and the drainage such as to cross the road several times. But where these conditions did not prevail, the repairs were little, if at all greater, than in the same length of straight tracing. Again, where the reaches were short, and the turning places cramped, zigzags should not be tolerated; but where each reach was not less than 600 to 700 yards in length, and where a semicircular turn of not less than 50-feet radius could be obtained, the inconvenience was small, and the danger a minimum. Generally 5·55 in 100 was the steepest admissible gradient for an unmetalled mountain cart road in India. No earthwork became permanent under two rainy seasons. Landslips occurred with every shower and every hard frost. On the Dalhousie cart road the mere cutting out of the hill-side to 14 feet in width determined a landslip upwards of 800 feet back from the edge of the road, and parallel to it for about 700 feet.

There were three different methods of making a road along the faces of vertical cliffs. The most expeditious was to form a gallery, carrying the road on cantilevers of iron or timber. This plan, however, was only suited for mule or bullock roads, and was inapplicable for cart roads. It had therefore been replaced by half-tunnels blasted out of the rock. From the nearest possible standing point a gangway of lashed scaffolding poles was run out horizontally along the face of the cliff, the near end being held down by two leaded jumpers, or by lewises let into the rock. A workman from the further end of the scaffold, drove into the rock a jumper-hole, slanting about 45°, which, when sufficiently deep, received an iron bar run with lead. To this support scaffolding was lashed, to act as a new starting point from which to advance another step. When the scaffolding so supported had extended along the whole length of the cliff, arrangements could be made for fixing the permanent cradles and cross-beams to carry the gallery. On the Hindustan and Thibet road the galleries were $7\frac{1}{2}$ feet wide, the supporting cradles being from 12 feet to 15 feet apart. The other modes of forming a road along the cliffs, were either by blasting in the usual manner, or by the use of mining galleries and heavy charges of powder. Where kunkur rock was met with, special cartridges were employed for blasting. This substance resembled petrified sponge, which, whilst allowing the powder to blow out through its pores, was so hard and tough as to defy the best steeled picks and jumpers.

On one section of the Hindustan and Thibet road, adjoining the glaciers, and where wood was abundant, blasting was abandoned for more than a year in favour of wood furnaces, while the fuel lasted. The rock, when intensely heated, and then quickly deluged with snow water, cracked and broke up, at a great saving of time and labour.

The ordinary daily task of native quarrymen in boring was about 60 inches in sandstone or conglomerate, 45 inches in limestone, and from 30 inches to 32 inches in granite. In attacking a cliff with large mines, a line of scaffolding was first erected along the face, and tunnels were driven into the rock, chambers being formed at the ends of return galleries to the right and left. The charges were placed at a horizontal distance from the cliff face of 2 feet more than the proposed width of the road, and generally blew out the rock on both sides to a distance equal to the line of least resistance. The galleries, which were 3 feet high by 2 feet 6 inches wide, could, in conglomerate, be driven at an average rate of 1 inch an hour, and at a cost of about 2s. per lineal foot. The rate of progress was three times and five times less in limestone or granite than in sandstone rock or conglomerate, which rendered mining a tedious operation. The galleries for the most part were chiselled with cold steel and not blasted. The most effectual mode of tamping mines in impracticable localities was by sandbags of date or palm-tree matting, containing about $\frac{1}{2}$ cubic foot of damp clay. With these and a few half-bags and quarter-bags, the tamping was built up by native masons like an ordinary wall. Cushions of sand greatly increased the effect of the explosion. This systematic method of tamping could be done at the rate of 12 lineal feet an hour, or three times the rate of tamping with earth, in the usual manner.

Dry masonry retaining walls were largely employed on most Himalayan roads, many of them being of great dimensions and of some constructive difficulty. Sandstone, notwithstanding its clean splitting and good bedding, was by no means so suitable a material for retaining walls as granite or limestone boulders, being liable to disintegrate under tropical rains in damp situations, as in foundations below the level of the ground. Retaining walls of what seemed most compact sandstone had suddenly collapsed, the underground courses having dissolved into sand. Where expensive masonry in mortar was used, great economy resulted from the best possible shape and dimensions being given to retaining walls; but where cheap dry masonry was employed, earth should never be used for the backing, but the space should be filled with boulders or stone chips.

The mere excavation of a wide road along a hill side at once altered the whole system of natural drainage. It was useless to commence any drainage works until the annual rains had marked out a line of discharge across the great catchwater formed by the road. On some parts of the Lahore and Peshawur road the main drains were 25 feet wide by 5 deep. On the Kangra road they averaged 10 feet wide by 3 feet deep. The smallest secondary drains should be 2 feet by 1 foot 3 inches; no cross drain, if provided with a movable slab top, being less than 2 feet by $2\frac{1}{2}$ feet, or, if permanently covered in, less than 2 feet 3 inches by 2 feet 9 inches. To insure proper scouring, and an easy change of direction for the water, the cross drains had a slope of 1 in 12, and were built at an angle of 135° with the side drain, their ends being properly secured by boulder pitching. The main drainage was carried across the road through culverts, but more especially through large outlets in dry masonry retaining walls, covered in by stone slabs of from $2\frac{1}{2}$-feet to 3-feet span. For larger spans, up to 10 feet, and where slate was procurable, dry rubble arches were built of picked stones neatly radiated and wedged up. Where building stone was scarce, concrete arches on dry masonry abutments were largely employed, the whole mass forming a monolith, rammed up in 4-inch horizontal layers. The Durroon Bridge, on the Kangra road, was 48-feet span in the clear by 20 feet wide. The arch was entirely composed of rammed mortar, consisting of 1 part of boulder lime, 1 part of pounded brick, and 1 part of sand, no broken stone whatever being used.

The shape generally given to the metalled road-surface on a mountain side was a slope of 1 in 18 from the outside to the inside. It had been objected to this slope that it converted the road into a drain, which was cut away and became impassable in heavy downpours; and on some of the Madras hill roads the slope was from the inside to the outside. Both systems had their respective advantages; but on the whole, the inside slope was preferable when the cross-drains were sufficiently large and numerous, and the side-drains rocky or properly protected by boulder paving. The usual practice was to adopt the outside slope until the drains were built and the side-slopes had taken their bearings, when, as a permanent arrangement, the road was finished and metalled with an inside slope. The metalling consisted of a 9-inch layer of broken granite, kunkur rock, or coarse slate shingle, and did not materially differ from an ordinary macadamised surface. The usual width of a mountain cart-road varied from 18 feet in open ground to 12 feet along cliffs, or in difficult places; the maximum gradients varying 1 in 18 to 1 in 25.

Proceedings of Societies.

ROYAL SOCIETY.

February 26th.—The President in the chair.—The following papers were read:—"The Winds of Northern India in Relation to the Temperature and Vapour Constituent of the Atmosphere," by Mr H. F. Blanford; "On White Lines in the Solar Spectrum," and "Note on Displacement of the Solar Spectrum," by Mr. J. B. N. Hennessey.

March 12th.—The President in the chair.—The following papers were read:—"Contributions to the Developmental History of the Mollusca: Loligo, Aplysia, Pisidium," by Mr. E. Ray Lankester, and "Description of a new Deep-Sea Thermometer," by Messrs. Negretti and Zambra.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

Tuesday, March 3rd.—Dr. Birch, F.S.A., President, in the chair.

The following candidates were duly elected Members of the Society:—Rev. Charles Bowden, M.A.; Rev. A. Paine; and Miss E. Rogers. The following papers were then read:—

1. Translation of an Egyptian Fabulous Romance, "The Tale of the Doomed Prince." From the Harris Papyri. By C. W. Goodwin, M.A.—This curious romance, which is unfortunately only a fragment, relates how a certain Egyptian King, in answer to his earnest prayers, obtained a son, of whom the Seven Athors (Parcæ) foretell that he will die by one of three deaths, either by a crocodile, a serpent, or a dog. To preserve his son, the king shuts him up in a tower with every luxury, and numerous attendants, who are charged to tell him nothing of the existence of these three animals. One day the prince sees an Egyptian go forth to hunt, accompanied by his dog, whereupon the prince desires such an animal. This leads to the disclosure of his destiny; but he worries his father into letting him have his way, saying it is useless to fly from fate. After that he also prevails upon the king to let him go out and see the world. Agreeably to this wish he travels alone to Naharanna (Mesopotamia), and passes as the son of an Egyptian horseman fleeing from the cruelty of a step-mother. Arrived at the court of the monarch of the country, he mingles with the courtiers, by whom he is told of the singular circumstances surrounding the king's daughter, who is shut up in a tower, from whence she can only be liberated by that lover who shall successfully scale the window of her prison. All the princes of Naharanna try to do this, and fail; but the young Egyptian, whose personal appearance wins the heart of the princess, is successful. Upon this the king her father refuses to give her in marriage to an unknown fugitive; but as she threatens suicide in the event of being refused, he

consents, and the lovers are united. Soon after the prince and his wife return to Egypt on a tour, and entering one of the temples to worship, he is attacked by a sacred crocodile, which he repels, and also by a giant, whom he overcomes. Weary with his exertions, the prince returns home to rest, while his wife watches beside him. Presently a serpent comes out of a hole to sting him during his sleep; but the princess offers the reptile some intoxicating drink, and when it is drunken, drowns the creature in her bath. On the prince awaking, he and his wife offer prayers and thanks for his deliverance from two of the foretold dooms. He then goes out for a walk, and is again met by the giant and crocodile, who warn him of his certain fate, to which he pays no heed. Two months afterwards the prince walks out, taking his dog with him, at this crisis the romance is suddenly broken off by the loss of the remainder of the papyrus. The learned translator drew attention to the peculiar features of this ancient story, resembling in so many points the romances of the mediæval period, which may have had a common origin.

2. Translation of an Historical Narrative belonging to the Reign of Thothmes III.—By C. W. Goodwin, M.A.—This translation, the original text of which is also contained in the Harris Papyri, relates the manner in which a certain chief officer of state, named Tahutia (*Thoth*), treacherously delivered up the fortress of the Imu (a people hitherto unknown to Egyptologists) to the armies of King Men-cheper ra (Thothmes III.), and enumerates further the amount of the spoil thus surrendered, and the rewards obtained by the traitor.

3. Observations upon the Assyrian Verbs Basu and Qabah.—By Prof. William Wright. This paper consisted of a critical analysis of the roots of the above verbs, and their cognatet analogues in other Semitic languages.

ASTRONOMICAL SOCIETY.

March 13th.—Professor Adams in the chair.—The following were the papers read:—"Notes on some Spectroscopic Observations of Sirius and γ Argus, &c.," by Mr. Pringle; "On the Structure of the Solar Photosphere," by Mr. Langley; "Notes to Accompany Chromo-lithographs from Drawings of the Planet Jupiter," by the Earl of Rosse; "Occultation of Neptune," by Mr. Talmage; "Note on the Zodiacal Light," by Mr. Knobel; "On the Obituary of the late Temple Chevalier," by Mr. Carrington; "On the Relative Magnitude of the 5th and 6th Stars in the Trapezium of Orion," by Mr. Barneby; "On Two Ancient Conjunctions of Mars and Jupiter," and "On the Zodiacal Light," by Mr. Johnson; Second paper "On the probable Variability of some of the Red Stars of Schjellerup's List," by Mr. Birmingham; "Note on the Curvature of the Lines in the Dispersion Spectrum and on a Method of Correcting it," by Mr. Christie; "On a Method of Drawing by Continued Motion an Approximation to a Parabola," by Mr. Penrose; "On a Remarkable Structure visible upon the Photographs of the Solar Eclipse of December 12, 1871, by Mr. A. C. Ranyard; "On the Solution of the Equations in the Method of Least Squares," and "Remarks on Two Papers of Mr. Stone on the Treatment of Observations," by Mr. J. W. L. Glaisher; and "On the Determination of Longitude by Chronometers by the late Capt. H. F. Murphy," by Mr. Lecky.

GEOLOGICAL SOCIETY.

February 20th.—Anunal General Meeting.—His Grace the Duke of Argyll, President, in the chair. The Secretary read the Reports of the Council, and of the Library and Museum Committee. The general condition of the Society was said to be satisfactory. After presenting the medals and proceeds of the Murchison and Wollaston Funds, the President read his Anniversary Address. The Address was prefaced by some obituary notices of Fellows and Foreign Members and correspondents deceased during the past year, including Mr. J. W. Flower, Mr. J. G. Marshall, Prof. Agassiz, and M. de Verneuil. The ballot for the Council and officers was taken, and the following were duly elected: President, J. Evans; Vice-Presidents, R. Etheridge, R. A. C. Godwin-Austen, Sir C. Lyell, Bart., and J. Prestwich; Secretaries, D. Forbes and Rev. T. Wiltshire; Foreign Secretary, W. W. Smyth; Treasurer, J. G. Jeffreys; Council, the Duke of Argyll, H. Bauerman, Prof. G. Busk, J. F. Campbell, F. Drew, Sir P. de M. G. Egerton, Bart., M.P., R. Etheridge, J. Evans, D. Forbes, Capt. D. Dalton, R. A. C. Godwin-Austen, J. G. Jeffreys, Sir C. Lyell, Bart., C. J. A. Meyer, J. C. Moore, J. Prestwich, Prof. A. C. Ramsay, S. Sharp, W. W. Smyth, Prof. J. Tennant, W. Whitaker, Rev. T. Wiltshire, and H. Woodward.

February 25th.—J. Evans, Esq., President, in the chair. Mr. A. J. Jukes-Browne and the Rev. M. H. Close were elected Fellows. The following communications were read: "Geological Notes on a Journey from Algiers to the Sahara," by Mr. G. Maw,—"On the Trimerellidæ, a Palæozoic Family of the Palliobranchs or Brachiopoda," by Mr. T. Davidson and Prof. W. King,—and "Note on the Occurrence of Sapphires and Rubies *in situ* with Corundum, at the Culsagee Corundum Mines, Macon Co., North Carolina," by Col. C. W. Jenks.

March 11th.—J. Evans, Esq., President, in the chair. Messrs. H. W. Jackson, R. Winn, M.P., E. Stutchbury, R. Carter, E. W. Hawker, D. R. Irvine, J. Horne, and A. W. Howitt, were elected Fellows; and Prof. E. Desore, of Neuchâtel, and Prof. A. Gaudry, of Paris, were elected Foreign Members. The following communications were read: "On the Relationship existing between the Echinothuridæ, Wyville Thomson, and the Perischoechinidæ, M'Coy," by Mr. R. Etheridge, junr.,—"On the Discovery of Foraminifera, &c., in the Boulder-Clays of Cheshire," by Mr. W. Shone, junr.,—and "On the Occurrence of a Tremadoc Area near the Wrekin in South Shropshire, with Description of a New Fauna," by Mr. C. Callaway."

VICTORIA (PHILOSOPHICAL) INSTITUTE.

A meeting of this Institute took place recently, when a paper on the Rules of Evidence as applicable to the Credibility of History was read by Mr. Forsyth, Q.C., M.P. The proceedings were commenced by the election of several new members, including Professors Swainson and Challis, Colonel Hogg, M.P., and others; after which letters expressing regret at being unavoidably prevented from being present were read from the Duke of Argyll, K.G.; Lord Malmesbury, Lord J. Manners, Lord H. Lennox, the Right Hon. Sir S. Northcote, Bart., Gathorne Hardy, R. A. Cross, Colonel Taylor, Sir J. Karslake, Sir B. Frere, Vice-Chancellor Cookson, Professors Chandler, Palmer, and others. After which Mr. Forsyth read his paper, which, starting with the axiom that it was as irrational to believe without any evidence, as to disbelieve against sufficient evidence, proceeded to analyse the amount of evidence which has, in the record of various events, been deemed sufficient to entitle those events to credit, and concluding by giving that referring to religion. An interesting discussion ensued.

THE INSTITUTION OF CIVIL ENGINEERS.

Tuesday, March 3rd, 1874.—Thos. E. Harrison, Esq., President, in the chair.—The first paper read was on "The Great Basses Lighthouse, Ceylon," by Mr. William Douglass, M. Inst. C.E.

As early as November, 1826, the late Sir J. J. Gordon Bremer, R.N., and the late Capt. W. F. Dawson, R.E., made an examination of the S. and E. coasts of Ceylon, one of the results of which was the recommendation for the erection of a beacon on the Great Basses. It was not until 1855, however, that the authorities gave instructions for the preparation of a design for the work. This design, submitted by the late Mr. Alexander Gordon, M. Inst. C.E., was for a cylindrical cast-iron tower, secured within an enlarged basement of masonry, which basement was to be inclosed within an outer casing of cast iron, and both tower and casing were to be sunk into the rock. Mr. Gordon's estimate for the work amounted to £33,946, and that sum having been sanctioned by the Board of Trade, Mr. W. W. Poingdestre was appointed the resident engineer, and left England for Ceylon in March, 1856. After three years' operations, and the expediture of about £40,000, only a few landings had been effected on the rock, and the authorities therefore suspended further proceedings.

In June, 1867, the whole question, as to the practicability, probable cost, and reasonable chance of success of the erection of a lighthouse on the Great Basses, was referred to the elder brethren of the Trinity House, who recommended for approval a design prepared by their engineer, Mr. J. N. Douglass, M. Inst. C.E. That design was for a granite structure, in which the base of the "Gordon" Lighthouse was proposed to be utilized. The plan further included a lantern and dioptric revolving apparatus of the first order; also a light vessel, to be moored off the rock, for exhibiting a red revolving light every night during the progress of the work, and to serve as a barrack for the executive engineer and staff. The total estimated cost of the works was £64,661. The design having been approved by the Board of Trade, and the Trinity House having agreed to undertake its execution, the necessary funds were voted by Parliament, and the work was immediately proceeded with. The author, who was then building the Wolf Rock Lighthouse, was appointed the executive engineer. The lighthouse consisted of a cylindrical base, 30 feet in height and 32 feet in diameter, on which was placed a tower, 67 feet 5 inches in height, 23 feet in diameter at the base, and 17 feet in diameter at the springing of the curve of the cavetto. The thickness of the wall was, at the base of the tower, 5 feet, and at the top 2 feet. The accommodation within consisted of six circular rooms, each 13 feet in diameter. There was also a room 12 feet in diameter in the basement, for coals and water, and a rain-water tank below, 7 feet 6 inches in diameter. From the floor of the tank to the rock, a depth of 11 feet 6 inches, the building was solid. The tower contained 12,288 cubic feet of granite, and the cylindrical base 25,077 cubic feet, making a total of 37,365 cubic feet, weighing about 2,768 tons. The stones forming the wall of the tower were dovetailed, both horizontally and vertically. Medina cement was used for the first and second courses, and Portland cement for the courses above these. The cylindrical 14 feet lantern of the Trinity House was adopted. The dioptric apparatus had eight panels of refractors, with upper and lower prisms, for emittiug flashes of red light at intervals of 45 seconds. A 5-cwt. bell, for a signal during foggy weather, was fixed on the lantern gallery.

The Great Basses reef was 80 miles to the eastward of Point de Galle, and 6 miles from the nearest land. It was about ⅝ mile long, ¼ mile broad, and was composed of hard red sandstone. The reef was exposed to both monsoons; therefore the days available for working on it were few. The only suitable season was during the N.E. monsoon, which commenced in November and terminated in April, the best months of the monsoon being the first and the two last. The coast for many miles on both sides of the Basses reef was almost continuously exposed to a heavy surf, and was without secure shelter for shipping. It was determined therefore to form at Galle a depôt, from which the operations at the rock were to be carried on. Two iron twin-screw steamers, each capable of carrying 120 tons of cargo, at a speed of 10 knots, were used for conveying the materials from the workyard at Galle to the rock, and for attending on the light vessel and floating barrack. The steamers were each fitted with two steam doubled-barrel winches, by which the stones of the tower were hoisted on board, stowed below, hoisted again to the deck, and from thence to the rock. The author was of opinion that this was the first instance of material being landed in a seaway from a vessel by means of her own steam power, excepting where the load could be deposited by her own swinging derrick. Although it was necessary to moor the steamers, when laden, at a distance of 30 fathoms from the rock, stones weighing on an average 2½ tons were by means of these winches hoisted out of the hold, landed, and deposited 28 feet above the rock, at the rate of ten per hour. On the 8th November, 1869, the author left England, and on the 7th March, 1870, landed on the rock for the first time. The building of brick dam round the seaward side of the foundation was at once proceeded with. It had since been faced with small ashlar and coped, and now formed a useful portion of the landing platform—also constructed of rubble stone in cement, and faced and coped with granite ashlar. This platform contained 10,443 cubic feet of masonry, making, together with the tower and base, a total of 47,808 cubic feet, or about 3,541 tons. The season ended on the 3rd May, when 36 landings had been effected, and 220 hours worked on the rock. The first landing of the season, 1870-71, took place on the 28th November, and the last on the 28th April. During this season 84 landings were effected, and 651 hours worked on the rock. The first stone was landed on the 28th December, and at the close of the season sixteen stones of the 21st course were set. The first landing for the season of 1871-72 took place on the 16th of November, and the last on the 2nd May. During the season, 74 landings were effected, and 679 hours worked on the rock. The remaining portion of the tower, from the 21st course, was set, and the framing of the lantern erected. The number of working days of ten hours, from the first landing on the rock to the end of the season 1871-72, was 155 days 3 hours; and from laying the first stone of the tower to setting the last stone of the gallery course 110 days. The staff comprised thirty-three Europeans, including an executive engineer, a chief foreman, an accountant, officers in charge of the vessels, seamen and mechanics, and fifty-one native seamen and workmen.

The light was exhibited on the 10th March, 1873, and had since been continued with regularity every night, from sunset to sunrise. The illuminant adopted was Ceylon cocoa-nut oil, at a price of about 2s. 3d. per gallon. The work was executed without loss of life or of limb to any person employed. The total cost of the undertaking was £64,300, being £361 below the original estimate.

The success attending the execution of this work had induced the authorities to order the erection of a similar lighthouse on the Little Basses reef, in accordance with a special design and estimate furnished by the engineer of the Trinity House. The Corporation of Trinity House had undertaken the execution of this work also, and the author was now employed in carrying it out, the vessels and plant from the work at Great Basses having been transferred and charged for that purpose.

At the monthly ballot the following candidates were balloted for and declared to be duly elected :—Messrs. A. W. Brind, A. H. McDonald, and J. A. Paskin, as Members; and Messrs. R. Ballard, O. Brown, Stud. Inst. C.E., T. Duerdin, Stud. Inst. C.E., M. Graham, Stud. Inst. C.E., G. G. M. Hardingham, Stud. Inst., C.E., Lieut.-Col. C. S. Hutchinson, R.E., Messrs. S. H. James, H. Leupold, M. Longridge, F. B. Maclaren, J. C. Searle, Stud. Inst. C.E., C. W. Whitaker, and A. Woods, as Associates.

It was reported that the council, acting under the provisions of the bye-laws, had recently transferred Messrs. J. Gordon and J. Tomlinson, jun., from the class of Associate to that of Member; and had admitted the following candidates as Students of the Institution, viz. :—Messrs. J. E. Catton, W. P. Churchward, H. H. Hely, W. H. Jones, W. G. Kerle, J. E. Paul, and W. Pole, jun.

Correspondence.

A PHRENOLOGIST ON THE CLAIMANT.

To the Editor of the SCIENTIFIC AND LITERARY REVIEW.

SIR,—Now that the time has come when "public opinion" may freely vent itself regarding the Claimant of the Tichborne Estates, perhaps a few words concerning his phrenological characteristics may be offered to "public notice" without fear on the part of either publisher or author. Of course, the idea will suggest itself to everyone that the phrenologist is always wise after the fact. In this case, however, no attempt will be made to appear wise in the matter, the object of this letter being only to direct attention to such characteristics of the late Claimant as have been published during his trial, that others, besides the phrenologist, may observe for themselves whether the same at all tally phrenologically with his portraits which everywhere abound. One particular faculty of the mind that especially claims our attention here, is that which, in the phrenological nomenclature of the mental faculties, is called language. Its function is to observe and remember words, sentences, paragraphs, &c. All persons possess this faculty, but some in a greater degree than others. While some find it difficult to command words to express their ideas, others, after once reading a newspaper through, are able to repeat it verbatim from beginning to end. This faculty should certainly not be wanting in Arthur Orton, or whatever his name is, to justify the idea that his knowledge of so many incidents of the life of Roger Tichborne had been acquired from the associates of the veritable Sir Roger. The question now arises, does his *organ* of language agree in development to the power of this proclivity? Does his portrait show the eye to be full enough and sufficiently projecting to indicate that the organ of language is well developed? Or is it a sunken eye, which shows that the organ of language which lies immediately behind it is of defective development?

It is now universally agreed, with one exception (Dr. Carpenter), that the organs of the intellectual faculties occupy the frontal or anterior region of the head: those of the moral sentiments (peculiar to man) the coronal or superior region, and that the propensities (which are common to man and animals), have their seat at the lower and posterior region of the head. In this particular it will be seen that phrenology teaches that when a man is led by his propensities he is, as it were, going backward; when by his intellect, he is going forward; and when by his sentiments he is going upward.

On looking at the portrait of the gentleman from Wagga-Wagga, it will be seen that the contour of the head shows a lack of height, while the lower and hinder parts are broad and heavy. In these respects it resembles the casts of Rush, Palmer, and Pritchard, which by phrenologists are regarded as a type which imports coarseness and brutal sensuality. These qualities are indicated less by a development of the organs of the propensities, than by their being unaccompanied with a fair development of the organs of the moral sentiments. Consonant with such an organization, we hear, from his own confession, that the life of the Claimant has been one of crime, drunkenness, and debauchery. It is when the organs of the moral sentiments are low, there is no compunction about what is said, thought, or done. The innocent may be slandered or defamed; a fellow-creature despoiled or injured; but honour is so cramped and confined that there is no room for it to swell into remorse. Hence it is with this type, that there being nothing within to make a criminal life unbearable, the struggle is so great, and the trial is so long, when such a life is about to receive a check. It will be recollected that the trials of the noted law-breakers before alluded to extended over some considerable time. All this, however, does not negative the fact that there are hundreds of thousands of the same type who never commit themselves. For, be it remembered, the circumstances of many are easy, and admit of the gratification of their propensities without their having recourse to illegitimate means. It is, no doubt, known to every judge and councillor, that if it was not for this type he would soon have to "shut up shop." It is difficult, if not impossible, to find one of the low sensual type doing the work of Plimsoll, Dr. Manning, or Viscountess Burdett-Coutts, whose heads form such a striking contrast to those before mentioned. Suspend the vigilance of the police but for a single night, and we should soon get a notion of where the organs of the moral sentiments are that keep in subjection the annual propensities of many. And now for the remedy. Let it form a part of every child's education to be careful when they grow up how they indulge children even while in arms, for parents frequently encourage in their children desires which, though harmless in infancy, tend by degrees to pernicious habits. If the babe should fall and hurt itself, never attempt to appease it by beating the place it fell against. If one child should hurt another, which is often done in their play, let the one hurt not seek to resent the injury, but rather to forgive it. Mrs. Child, in her book "The Frugal Housewife," gives this useful piece of information. She says: —"In early childhood, you lay the foundation of poverty or riches in the habits you give your children. Teach them to save everything—not for their own use, for that would make them selfish—but for some use. Teach them to share reasonably with their playmates, but never allow them to destroy anything." And it is by pampering children that habits of laziness and imtemperance are generated, whose constant attendants are poverty and disease, out of which spring the many vices that lead to bad ends. Such are the practical suggestions of phrenology for checking the growth of mental inequalities.—I am, Sir, yours respectfully,

A. L. VAGO.

⁂ [We gladly afford space for the above, because we think that phrenology, especially when handled by any one so earnest and moderate as Mr. Vago, has too much promise of utility in estimation of human character to be pooh-poohed, and not in any way as an expression of our opinion upon its tenour or on the value of the application of phrenology to such a person as the Claimant, especially without personal manipulation.—ED. S. and L. R.]

COMMUNICATION IN TRAINS.

To the Editor of the SCIENTIFIC AND LITERARY REVIEW.

SIR,—On reading your issue of the 1st inst., I find a somewhat able paper on "Railway Train Communication," by C. F. Roe, Esq., introducing to notice an invention by Mr. E. Stapleton. Doubtless the invention would work, but I think the wear and tear of continued motion would soon produce leakages in air tubes, and render them worthless. I should be sorry to be thought applauding the sound of my own trumpet—as I regret to be the only means of bringing an invention of my own before you. But I am perfectly convinced that Mr. Stapleton's invention must yield to mine. I need not, perhaps, advert to its peculiar advantages over anything I have heard of or seen, as my invention will appear in the International Exhibition of this year, and I do earnestly solicit the inspection of my invention by scientific men, which I believe will operate very favourably on their minds. My apparatus is durable, being all iron; a child may work it; and guard and engine-driver may communicate with each other independent of the passengers, and may even talk to each other on two small bells—one on the engine-driver's tender and the other in the guard's box. I have two other inventions essentially connected with railway traffic which will appear on my model carriages at the International at the same time.—I am, Sir, your obedient servant,

JOHN WYATT.

Rose Cottage, Slopton,
March 7th, 1874.

APPLICATIONS FOR LETTERS PATENT.

(Continued from page 46.)

—G. Hastletine. Hinges (com.)—H. Highton. Electric telegraphs.—H. B. Barlow. Embroidering machines (com.)—J. C. Browne. Apparatus for raising, forcing, and exhausting water, air, or other fluid, also for lifting, directing, and guiding balloons and flying machines.

On December 31st. — 4280 to 4294. — B. Hunt. Printing presses and machinery or apparatus connected therewith (com.)—B. Walker, jun. Apparatus applicable to bobbin net or twist lace machines and warp lace machines.—G. Clark. Pavements.—W. M. Ward. Mills or crushers for grinding or crushing mineral and other substances for mixing mortar and cement, and other like purposes. — J. J. Bodmer. Treatment of peat, sewage deposit, and substances used in the manufacture of artificial manure, and in the application of part of the said materials as fuel, and as parts of compounds for metallurgical operations. — W. H. Beckitt. Valves.— G. A. Wuth. Extracting and utilizing waste, fatty, and colouring matters contained in the washings of print and dye works (com.) —J. Mackintire. Moulds for casting metals.—W. R. Carr. Boring machine.—G. H. Williams. Collar for horses or other animals.—B. Hunt. Manufacture of nutritive hygienic compounds or preparations (com.) (Complete specification.) —J. H. Johnson. Puddling iron and steel, and the machinery employed therein (com.) —J. H. Johnson. Blowing machines (com.) — G. Skinner. Extension ladders.—A. M. Clark. Manufacture of gas and fuel (com.)

On January 1st.—1 to 18.—W. Cotter. Telescopic or folding combined bedstead and air bed —J. Fowlie. Harness or arrangements used for traction by animal power and when carrying loads upon animals.—J. Lamont. Manufacture of illuminating gas, and apparatus or mechanism connected therewith.—G. Duckett. Size and the method of sizing. — W. Morgan-Brown. Uniting leather work, in the fastenings for that purpose, in the mechanism for making such fastenings, and in the mechanism for drawing said fastenings (com.) — R. Gotheil. Apparatus for measuring the heat of fluids passing through pipes (com.)—J. Parker. Apparatus for rolling railway carriage and other wheel tyres. — L. Leon. Fire-escape or apparatus for saving life in case of fires, applicable also for facilitating descent over ships' sides, and for other similar purposes.—L. M. Becker. Shuttles, spools, and bobbins for sewing machines and other purposes. — J. H. Johnson. Manufacture of steel (com.) (Complete specification.) — H. B. Barlow. Apparatus for delivering and drawing long fibred wool after carding (com.) — W. Abbott. Ships' boats. — P. Jensen. Breech-loading fire-arms.—H. A. Bonneville. Printing press (com.) (Complete specification.)—H. A. Bonneville. Copying press (com.) (Complete specification.)—L. Deny. Forming strainers, and improved tool for preparing perforated metal plates for the same.—G. A. Bachholz. Obtaining motive power. — J. H. Johnson. Treatment and preservation of textile materials and fabrics, wood, ligneous substances, and paper and the dressing or product employed therefor.

On January 2nd.—19 to 36.—S. H. Johnson. Method of and apparatus for separating free sulphur from substances with which it is mixed. —A. Dudgeon. Method of utilizing the heat of furnaces in the generation of steam.—R. Gottheil. Apparatus for washing, opening, drying, and oiling wool, and for regulating the supply of soap solution and oil thereto (com.)—A Dudgeon. Manufacture of peat for fuel.—W. B. Robins. Hydronettes, hand pumps, and syringes.—F. Curtis. Lamps (com.) (Complete specification).—R. Gottheil. Motors to be worked by gas (com.)—Rev. G. H. Forbes. Manufacture of gas for illuminating and heating purposes.—R. W. Page. Actuating the valves of steam engines.—Rev. G. H. Forbes. Compound to be used as fuel.—H. T. Green and C. W. Price. Brakes for railway trains.—R. A. Threlfall, W. Hamer, and J. Bond. Polishing fluted rollers used in machinery for preparing and spinning cotton and other fibrous materials. —W. Sutherland. Painting, gilding, silvering, and ornamenting the surface of glass and protecting the same from injury.—T. Lancaster. Supplying fuel to steam boiler and other furnaces and fire grates, and in fire bars to be used therewith.—A. V. Camp and G. Clark. Road street, and pathway pavements.—G. H. Forbes. Compounds designed for the manufacture of cements, plaster, or artificial stone, capable also of being used for artificial fuel.—G. Haseltine. Combined high and low pressure steam engines (com.) (Complete specification).—R. Gottheil Apparatus for dying warps (com.)

On January 3rd.—37 to 50.—S. Cohne. Composition for axle and shaft and spindle and other similar bearings, and the manufacture of bearings therefrom.—G. Chapman. Making sesquicarbonate of ammonia.—H. J. Westrup. Apparatus for indicating the position of the rudder in vessels.—J. T. Emslie. Registering the number of passengers or people entering or leaving tramway cars, omnibuses, &c.—H. M. Nicholls. Apparatus for cutting continuous paper into sheets, and piling or disposing of the same when cut.—A. Higginson. Governors for motive-power engines.—J. Petrie. Apparatus for scouring or washing and dyeing wool and other fibrous materials.—J. Harrington. Locks or fastenings.—J. Paterson. Apparatus for capsuling bottles and other vessels.—J. Lancaster. Horses-shoes.—J. Peel. Looms for weaving.—J. Betteley. Construction of propellers, and the arrangement or method of fitting them in vessels for the propulsion thereof.—E. P. Clark. Apparatus for teaching infantry drill.—W. A. Gibbs. Apparatus for drying.

On January 5th.—51 to 60.—J. McNeil and W. Macgeorge. Circulating water-tubes for boilers, and method for forming the same.—W. Poulson. Appliances or apparatus to be used in unloading bulk cargo from ships.—D. C. Knab. Preventing the incrustation of boilers and the apparatus connected therewith.—W. R. C. Chamberlain. Electro motive-power.—R. G. Perry. Kilns or drying chambers for drying peat, malt, grain, brewers' or distillers' grains, hops, or other similar substances.—N. A. Delavigne. Corkscrew.—H. Aitken. Coking coal and other carbonaceous matters, and in the apparatus employed therefor.—G. T. Bousfield. Rotary engines and pumps (com.) (Complete specfication.)—A. C. Andrews. Machinery to be used in the manufacture of boots and shoes.—P. G. B. Westmacott. Hydraulic capstans and such like hauling machinery, partly applicable to mounting hydraulic engines for giving motion to other machinery.

On January 6th.—61 to 75.—E. Molyneux. Apparatus for extracting tea from the communited leaf.—S. Rawsthorne and J. Hartley. Size and finishing yarn when sized.—J. Quin. Protecting indiarubber valves, tubes, and other like articles from chemical action.—M. Benson. Structure of furnaces and apparatus connected therewith for manufacturing iron and other metals by the use of hydrocarbon vapour or gas, combined with or without superheated steam for heating purposes (com.)—W. Kennedy. Apparatus or means for supplying brushes with powder.—A. Browne. Apparatus for raising sunken and wrecked vessels (com.)—G. C. L. Lenox. Apparatus for holding chain cables.—F. Holmes. Machinery for polishing stone, marble, and other hard substances.—A. M. Clark. Combustion of fuel and generation of steam in furnaces (com.) (Complete specification).—A. M. Clark. Apparatus for regulating the pressure and friction of fluids (com.) (Complete specification).—J. Harrington. Treatment of the "splits" and "fleshes" of skins or "hides," and of "buffed leather," and of leather or skins, the grain of which is imperfect, in order to render them suitable to be employed for most purposes to which good surfaced leather is applied.—W. E. Newton. Process for preparing hydrate of magnesia (com.)—J. H. Johnson. Warming railway carriages (com.)—J. Steel and J. McInnes. Apparatus for actuating the brakes of railway carriages by compressed air, part or parts of which are also applicable for signalling in railway trains.—S. W. Wilson. Electrical-brake apparatus for railway purposes.

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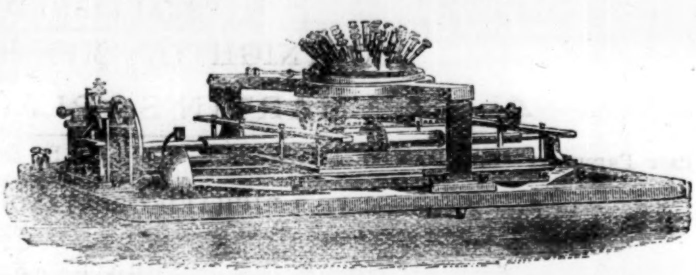

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